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OBSERVATIONS ON THE MEASURE OF CHANGE.

By Charles H. Cooley.

It is clear that one who attempts to study precisely things that are changing must have a great deal to do with measures of change. Now, almost all those phenomena of society with which the statistician is chiefly interested are in constant motion, cannot be caught and pinned down permanently in one place, but must be taken on the wing and their velocity measured. Next to their present position their direction and velocity are the most important things to be known about them, since these alone give us any power to forecast future positions.

It is to be noted in regard to measures of change that, like all other measures, their usefulness depends very much on the degree in which they facilitate comparisons. As we use feet and inches to get a precise notion of the relation between two lengths, so we need a standard measure that shall enable us accurately to compare the magnitude of various changes. A rude measure of change is obtained by a simple statement

of the difference between the two states of the quantity studied, as when we say that the population of the United States increased some twelve millions during the last decade. But this does not enable us to tell whether the increase in the length of railways, supposing that to be known, kept pace with the population or not; does not even answer satisfactorily the question how the increase of negroes, some 885 thousand, compares with that of the population as a whole. We want to be able, if possible, to say this change is equal to that; this is twice as great or a half greater; this the same but in the opposite direction, etc.

A measure intended to supply this need is actually in use in statistical work. This is the per cent of increase, or, more accurately, the ratio between two stages of a quantity. The colored population, it would appear, increased only about 13 in the hundred, as against 25 in the hundred for the population in general. Ohio grew about one per cent faster than New York, and about seven per cent slower than Pennsylvania,—comparisons impossible without some standard measure of change. Clearly the idea here is that of finding the relation between the magnitude of the change and that of the quantity changing, and using this relation as a means of comparison. "For its size," Detroit grew much more than New York, though less than Chicago.

I take it that, leaving aside a very few thoughtful students, this relation computed in the ordinary way is accepted as being in truth what it apparently purports to be, an absolute and true measure of change. An increase of 50 per cent is twice as great as an increase of 25 per cent, and equal, though differently directed, to a decrease of 50 per cent. In the ordinary statistical presentation of such facts there is everything to corroborate this notion, and nothing to warn against it.

Yet surely it may readily be shown that the notion is altogether erroneous. Suppose, for example, that during the past ten years a certain city changed in population from 20

thousand to 40 thousand, while another changed from 40 thousand to 20 thousand. It is axiomatic that these changes are equal though of opposite direction; are negative equivalents. Occurring successively in the same city, they would bring it back precisely to its first state. Yet, in the column headed "per cent of increase or decrease" these changes would appear as an increase of 100 per cent, and a decrease of 50 per cent, respectively. If prices were the subject of study, changes of from 20 cents to 40 and the reverse would be expressed in the same way. If these per cents were now added together and averaged, as is commonly done in this latter class of researches, we should have for the two prices an average increase of 25 per cent,—an absurdity sufficient to cast the darkest suspicion on the whole process. Changes from 20 to 30 cents and back will yield an average increase of over 8 per cent, another contradiction of the axiom *ex nihilo nihil fit*. As we have in each case a mean increase, one may suspect at once that this method makes increases appear greater, as compared with decreases, than they really are.

Such inconsistencies as these have by no means passed unobserved, though from the small recognition they receive in statistical practice, it would appear that the perception of them is not at all general. Prof. Jevons, as is well known, favored and practiced the treatment of such ratios by the method of geometric means. Before speaking of this method, however, I wish to apply the test used above to the method of harmonic means, which has also been proposed. In the first number of the *Quarterly Journal of Economics*, page 83, Mr. F. Coggeshall presents some acute criticisms upon the method of Jevons, shows that the harmonic mean produces results in some respects less objectionable, and seems to suggest the use of the latter wherever the greater difficulty of computation does not preclude it. Suppose, however, we test the harmonic mean by the axiom already suggested, that

a true measure of change must show the equality of equal changes. The formula for this mean is —

$$\frac{1}{x} = \frac{\frac{1}{a} + \frac{1}{b} + \cdots \frac{1}{m}}{n}$$

where a, b, etc. are the ratios or per cents to be averaged, n their number, and x the required mean. Applied to the case of two prices mentioned above, undergoing equal but opposite changes, this method would show, where the changes are from 20 to 40 cents and back, a mean decrease of 20 per cent. Equal changes of 10 cents give a mean decrease of nearly 8 per cent. Instead of the mean condition remaining unchanged, as is actually the case, it is represented as falling from 100 to 80 in the first case, or 92 in the second.

As I have never seen the question treated from precisely this point of view, I venture to offer a tabulated statement of the effect of treating pairs of equal changes by these two methods.

A TEST OF MEANS BY PAIRS OF EQUAL CHANGES.

Equal Changes.	Common Expression of Changes.	Arithmetic Mean.		Harmonic Mean.	
		Mean.	Error in Mean.	Mean.	Error in Mean.
20-21	100-105				
21-20	100-95.2	100.1	+.1	99.9	—.1
20-22	100-110				
22-20	100-90.9	100.5	+.5	99.5	—.5
20-24	100-120				
24-20	100-83.3	101.7	+1.7	98.4	—1.6
20-26	100-130				
26-20	100-76.9	103.5	+3.5	96.6	—3.4
20-30	100-150				
30-20	100-66.7	108.3	+8.3	92.3	—7.7
20-40	100-200				
40-20	100-50	125.0	+25.0	80.0	—20.0
20-60	100-300				
60-20	100-33.3	166.7	+66.7	60.0	—40.0

From the point of view here taken it certainly seems that one might draw from these facts two propositions, namely,—

1. That the common method of averaging ratios or index numbers by the arithmetical mean exaggerates increases relatively to decreases; and this so much that it is unfit for use, except where the degrees of change are minute.*

2. That the method of the harmonic mean exaggerates decreases relatively to increases in an almost equal degree, and is similarly unfit for use.

The use of the geometric mean in connection with these ratios or index numbers is not so readily assailable. This mean, of course, is that obtained by multiplying together the several quantities to be averaged, and taking that root of their product whose index is the number of quantities. Thus, if there are three quantities the cube root of their product is taken. The use of logarithms makes this process nearly as easy as that for the arithmetic mean. Applied to pairs of equal changes it will always justify itself by showing no change in the mean,—as may readily be ascertained by averaging in this manner the ratios in the second column of the table. This, to be sure, does not prove the method correct, but only that its errors, if there are any, enter equally into increases and decreases. It does, however, make a strong probability in its favor. Indeed, one may say, without pretending to great mathematical insight, that it seems reasonable that the mean force of a number of quantities *as multipliers* (ratios being such) is obtained by that method which averages them as multipliers, that is, by the method of geometric means.

But there is certainly something unsatisfactory in the results of the geometric mean. Mr. Coggeshall perceived

* Unless I am mistaken, even Prof. Falkner has been misled by the use of this method. On p. lxviii of his recent admirable Report to the Senate Committee on Finance I read: "The result of such a calculation [for a mean of index numbers] * * * * is 100.31 as the ratio for these special industries. This is a confirmation of the results," etc.; the ratio being taken as showing a slight mean increase. Of course, this increase is unimportant in any case, but is it not also entirely fictitious? I find the geometrical [true?] mean of these ratios to be 100.00+. *It is the inevitable and persistent tendency of this method*, even in the ablest hands, *to make increases appear where none exist, and even to change real decreases into apparent increases.*

this when he wrote the criticism above mentioned, but it does not seem to me that he indicated the true nature of the difficulty. I imagine that I can suggest where this difficulty lies, even though I cannot propose a satisfactory remedy.

Does not the trouble arise from the confusion of two distinct questions? These are, I think, first, What is the proper way of obtaining the mean of a series of ratios? and, second, What is the best way to measure changes? To the first question I should answer that the use of the geometric mean affords the only correct method of averaging ratios (or index numbers, which are nothing different), and for proof of this I would point to the considerations that have already been brought forward, and to many others that might be. To the second I should answer that the use of ratios for the measurement and comparison of changes, though mathematically justifiable, is open to serious practical objections. These are the difficulty of understanding and the inconvenience of applying the methods by which alone these ratios can correctly be compared with one another. As already suggested, an increase of 50 per cent is not at all the negative equivalent of a decrease of 50 per cent, nor has it twice the value of an increase of 25 per cent. These relations are inevitably suggested to the unthinking mind by the usual statistical presentation of facts of change, especially by those decapitated quantities contained in columns headed "Per cents of increase or decrease." But no such relations exist. The change negatively equivalent to an increase of 50 per cent is expressed by that ratio which, multiplied by 1.50, will produce unity, namely, .67. The ratio expressing a change having half the value of an increase of 50 per cent is found only by extracting the square root of 1.50. As a means of exposition, then, of expressing to the ordinary mind the comparative value of changes, this method is open to the gravest objection.

If a way could be devised by which these comparisons could be made in the simple and direct manner that we use

in comparing measurements of length or weight, it would, I think, be of the greatest usefulness, and do away with much misunderstanding.

I have myself made some use of a method of denoting the relative value of changes which, though not invulnerable on the mathematical side, renders possible a more simple and direct comparison. That it can be made widely useful I would not venture to assert. It is reached in the following manner.

It has already been suggested that the idea underlying the measurement of changes by per cents is that of finding the relation between the magnitude of the change and that of the quantity changing. In the ordinary method this relation is expressed as the per cent giving the magnitude of the change as compared with the first state of the quantity. But why the first state? Why is a change of from 100 to 150 a change of 50 per cent rather than of 33.3 per cent? There seems no reason in the nature of things why the first state should be chosen as a base rather than the last. The quantity in question has varied, according to some unknown law, from 100 to 150. If a single number is to be chosen as a representative of its magnitude during this period, surely that number should be neither of the extremes, but one representing the mean or average condition,— say 125. The method, then, is to base the per cent of change not on the first state of the changing quantity but on the mean between the two states. The following advantages may be claimed for this plan: —

Equal increases and decreases will be represented by the same per cents. A decrease of 50 per cent will be in fact the negative equivalent of an increase of 50 per cent. Thus, a change from 100 to 200 will be represented by +.67, the reverse by —.67. An immediate and exact ascertainment of this relation of equality, the most important of all, will be possible.

The true relation among various changes will be approxi-

mately represented by the simple arithmetical relation among the per cents of change. The difference between the two methods in this respect may be shown as follows.

The change from 100 to 200 may be regarded as the sum of the following changes: 100–114, 114–136, 136–180, 180–200. These would be expressed by the following per cents:

Change.	Common Expression.	Proposed Expression.
100-114	14 per cent.	13.1 per cent.
114-136	19.3 "	17.6 "
136-180	32.4 "	27.8 "
180-200	11.1 "	10.5 "
Sum,	76.8	69.0
100-200	100.0	66.6

The point here brought out is that while under the common method the total change appears as something very different from the sum of all its parts, the discrepancy under the method suggested is quite small.

COST STATISTICS OF PUBLIC ELECTRIC LIGHTING.

By Victor Rosewater,
School of Political Science, Columbia College.

Among the various papers published upon the subject of municipal control of public electric lighting the showing made by the statistics of cost is always an important factor. Whatever be the point of view of the writers, they seem to present their own figures and yet to arrive at essentially inconsistent results. What I propose to do here, then, is simply to touch upon a few of the limitations which must be borne in mind by anyone who wishes to give these statistics their due scientific weight.

I. Contract Prices.

What is the cost of an electric street-lamp to a city? The answer naturally suggesting itself would be that it is the contract price paid to the lighting corporation. If we have this sum, then we can compare the prices paid in different cities and judge whether the one is being more imposed upon by a so-called relentless monopoly than the other. This is evidently the idea that controlled the officials of the Eleventh Census when they compiled the materials for Census Bulletin No. 100. In that document they present the number of electric street-lamps employed in fifty different cities, the annual cost of each lamp, and the ratio of cost to each head of population. No extended consideration is needed to learn that these figures are absolutely without significance. The fatal defect lies in the fact that they do not show the amount of lighting service. In one place the lamps may burn but five hours nightly for only twenty nights in the month; in another they may be operated all of every night. Even overlooking minor omissions, which will be pointed out in a

moment, any comparison of absolute contract prices is fallacious at the outset. In this respect the Census Bulletin is not the only transgressor; of the many tables illustrating this point, which are found in popular discussions, those that have escaped this initial stumbling-block may be counted without great difficulty.

Leaving aside the Census Bulletin, we may, nevertheless, still find an authoritative presentation of contract prices of public electric lighting that does not have its chief merit in giving too little information. I refer to a report of the Engineer Commissioner of the District of Columbia,[1] from which Table I has been extracted.

Here, notwithstanding the fact that only those cities have been selected in which the lamps burn a period popularly known as "all of every night," the actual period of illumination is given in each instance. We also have data upon several collateral points. Important among these are the terms of the contracts in force. In these cities they vary from monthly renewals to a duration of ten years. The bearing of this point upon the question of price is this: If a city advertises at the same time for bids for lighting under contracts for one, three, five, or ten years, respectively, it will be found that the proposals for different terms will vary materially. The difference between a certainty of work and an uncertainty of work will be calculated on a money basis by the contractor, and will find assertion in the prices offered. To compare the cost of an electric lamp supplied under a ten-year contract with that of one supplied under monthly agreements cannot be strictly accurate.

Again, the location of the wires may be a factor influencing the cost of street illumination to a city, in which the municipal authorities compel the franchised corporations to place their wires under ground. What they in fact do is to compel an increased capitalization of the private company in order to meet the extraordinary expenditure. The larger

[1] 51st Cong., 2nd Sess., Senate Misc. Doc. No. 56.

TABLE I. ARC LAMPS OF 2000 NOMINAL CANDLE-POWER. DECEMBER, 1890.

Cities.	Number of Arc Lamps.	Contract Price per Lamp per Year.	Nightly Period of Illumination.	Term of Contract.	Location of Wires.
New York	883	$123.73*	Sunset to sunrise	Annual	A few under ground.
Chicago	112	175.00	Dusk to daylight		Overhead.
Philadelphia	1,293	174.29*	Sunset to sunrise	Annual	" and under ground.
Brooklyn	1,528	182.50	30 minutes after sundown to 30 minutes before sunrise.	"	"
St. Louis	1,822	74.95	30 minutes after sundown to 45 minutes before sunrise.	Ten years	"
Boston	1,125	146.00	Sunset to sunrise		"
Baltimore	655	127.75	Sunset to break of day	Five years	"
Cincinnati	27	144.00	All of every night	Monthly	"
Cleveland	105	139.12	" " " "	Annual	"
Buffalo	1,455	146.00	" " " "	"	" and under ground.
New Orleans	1,013	134.76*	Sunset to sunrise	Five years	"
Pittsburgh	920	100.00	Dusk to daylight	Three years	"
Detroit	827	140.05	30 minutes after sunset to 30 minutes before sunrise.	" "	One half mile under ground.
Milwaukee	417	112.50	Sunset to sunrise	One year	Over head and under ground.
Newark	420	146.00	All of every night	Five years	"
Jersey City	87	85.82	Sunset to sunrise	Annual	"
Louisville	6	127.75	All of every night	"	"
Omaha	117	175.00	" " " "	Five years	"
Rochester	1,142	102.20	Sunset to sunrise	Two to five years	"
Kansas City	125	200.75	All of every night		"
Providence	650	160.60	30 minutes after sundown to 30 minutes before sunrise.	Five years	"
Indianapolis	112	62.25*	All of every night	Annual	"
Denver	221	198.90*	" " " "	Five years	"
Allegheny	16	180.00	Dusk to daylight	Annual	"
Average of 24 cities	628.3	140.00			
Washington	206	219.00	Sunset to sunrise	Annual	All under ground.

* Average.

capitalization — in this instance actual and legitimate — can scarcely fail to register an influence upon the price of the product. Those cities in which the wires are in part under ground are undoubtedly expending more for their street illumination than they would otherwise be paying. An illustration may be drawn from the condition of affairs in New York City. The lighting is here distributed without competition among the six companies, which have divided the field with one another. Those located in the business districts secure a slight differential on account of the under ground wiring. In any precise comparison of cost statistics, differences in the location of wires ought to be given a qualified consideration.

Analogous to the distinction just noted are the differences founded in the location of the lamps. These differences take on three distinct forms with reference to the system of hanging, with reference to the number of lamps, and with reference to the relative profitableness of the district.

First, the lamps may be erected upon towers, upon poles, or at street intersections. These different systems necessitate a different expenditure for the particular lighting apparatus. The towers are often quite expensively built. Unlike poles, they are with difficulty removed from one place, where they are no longer wanted, to a place where they are demanded. The poles and gearing for intersection lamps, on the other hand, are comparatively inexpensive.

Second, the lamps may be supplied in clusters or distributed singly. When placed upon towers the usual custom is to bunch a considerable number of lights. The new lamps on Fifth Avenue in New York are erected two on each pole. Most commonly, however, the lamps, when placed upon poles or hung at street intersections, are supplied singly only. Differences in this particular result in differences in the labor service needed. To renew the carbons in two lamps upon one pole requires less than twice the labor of renewing them in two lamps on different poles. The frequency of the lights

has a bearing of a similar character. It is less laborious to attend to many lamps in a small area than to fewer lamps scattered over a wide area.

Third, a private company will be influenced in making bids for public street lighting by the profitableness of the district to be lighted. The business of supplying electric lighting is acknowledged to be one which follows the economic law of increasing returns. Sir John Pender, in his report as president to the directors of the Metropolitan Electrical Supply Company, Limited, of London, said, about a year and a half ago: "Our working expenses in the past, and even at present, are, with few exceptions, the same to all intents and purposes as they will be when we are giving our present maximum supply of 114,000 lights. When I state to you that we have made a small profit on the out-turn of 30,000 lights, it does not require a great amount of imagination to see that it must be a very good business if we can conduct 114,000 lights with a comparatively small increase of expenses." An equally apt illustration of this point appeared recently in New York City in connection with the annual reletting of lighting contracts. The bid of the United States Electric Light Company was for 50 cents a night per light for 17 lamps, and 40 cents a night for 351 lamps. The increase of ten cents a night was demanded in those streets only where no other business outside of the public lighting could be secured. In this case the difference in conditions was reduced to a money measurement,—$36.50 per lamp per year. A factor of such dimensions ought not to be lost sight of in making systematic comparisons.

II. Cost under Municipal Ownership.

If we turn now to the cost statistics of electric lighting under municipal ownership of the plant, we strike a set of complications no less serious. At the very beginning of every such investigation we find ourselves in the chaos of American municipal book-keeping. When no two cities employ

the same system of accounts, when in the same city the reports of different departments furnish irreconcilable data, the statistician must seek to extricate himself as best he can. It would scarcely be stating the case too strongly if we should say that out of the probable 150 municipalities owning their own electric lighting plants not five could present an intelligible showing of their operations for the period of one year. The blame for this does not attach entirely to the city officials, for conditions exist in many localities which render a clear financial account a thing next to impossibility. As an example of a concise and commendable statement of the workings of a municipal plant, I cite that relating to Topeka, lately communicated by Mr. Lewis Kingman to the American Society of Civil Engineers, and given as Table No. II.

The special difficulties arising in this connection are of a two-fold character,— those relating to the cost of the installation, and those relating to the annual operating expenses. In most instances the bonded indebtedness incurred for the particular purpose does not cover the entire capital outlay. To add in the proper amount of interest charges requires, then, an assumed capitalization. Where the plant is conducted in conjunction with other monopolies of service, with the water-works, for example, we have a system of joint production, which defies a statistical separation of expenditures. The same obstacle presents itself in relation to the operating expenses. The superintendent may devote only a portion of his time to electric lighting; the line men may attend to the fire-alarm telegraph; the engineers and firemen may be employed at the same time in more than one department. Again, the geographical situation has much to do with determining the cost of the motive power, whether or not water power may be used, or, if steam, the quantity and quality of the fuel. Still another bone of contention lies in the percentage of depreciation to be added to the expense account. This must at all events be an assumed calculation. In Table No. III, prepared by the Electrical Commission of

TABLE II. COST OF OPERATING THE TOPEKA ELECTRIC LIGHT PLAN

Year and Month.	Nights Run During Month.	Hours Run During Month.	Average Number of Hours Run.	Coal.		Cost of Coal per Horse Power.		Cost of Carbons.	
				Tons.	Cost.	Per Night.	Per Hour.		
1889. Nov.....	28	340.03	12.14	236.00	$566.40	8.60	0.71	$110.07	
Dec.....	29	373.47	12.88	261.00	626.40	9.19	0.71	142.40	
1890. Jan.....	29	357.40	12.32	222.00	532.80	7.82	0.63	142.40	
Feb.....	26	298.73	11.49	216.90	520.56	8.52	0.74	123.00	
March...	27	274.83	10.18	194.85	459.40	7.24	0.71	123.00	
April....	30	265.42	8.84	190.00	456.00	6.47	0.73	109.67	
May.....	28	171.92	6.14	156.00	374.40	5.69	0.93	70.27	
June.....	27	132.91	4.92	76.00	182.40	2.87	0.58	50.90	
July.....	28	146.34	5.22	110.40	283.86	4.31	0.82	50.00	
August..	28	182.50	6.51	144.00	345.60	5.25	0.80	70.27	
Sept.....	27	211.69	7.87	154.30	403.66	6.36	0.81	81.98	
Oct.....	25	204.04	8.16	110.00	361.11	6.15	0.75	79.56	
Nov.....	24	206.00	8.58	126.35	385.37	6.83	0.80	74.02	
Dec.....	25	198.25	7.93	123.40	373.70	6.36	0.80	83.65	
1891. Jan.....	24	189.17	7.88	122.65	374.08	6.63	0.84	71.70	
Feb.....	21	157.50	7.50	83.75	249.18	5.05	0.67	65.72	
March...	23	158.50	6.89	102.80	302.73	5.60	0.81	71.70	
April....	21	141.83	6.75	109.00	317.42	6.43	0.95	64.80	
May.....	23	127.05	5.52	101.00	294.99	5.46	0.99	60.00	
June.....	23	118.08	5.13	86.80	264.74	4.89	0.95	55.20	
July.....	27	138.75	5.14	75.13	230.73	3.63	0.71	55.80	
August..	28	172.05	6.14	90.10	274.80	4.17	0.68	72.00	
Sept.....	30	251.05	8.37	108.95	331.55	4.70	0.56	72.00	
Oct.....	16	140.75	8.79	106.00	323.30	5.60	0.98	60.00	
Nov.....	28	244.41	8.73	136.45	395.70	6.01	0.69	96.00	
Dec.....	27	227.50	8.43	143.20	415.28	6.54	0.77	90.00	
Totals.....	672	5,430.17	Av., 8.08	3,587.03	$9,646.16	Av., 6.11	Av., 0.76	$2,146.11	
Per cent of total expense.....					26.04			5.79	

Cost of lots and buildings, $8,559.33; cost of plant, p

The plant consists of a building and a lot with a railroad switch in the rear; there are three boilers and three eng There are six circuits, with 24.72 miles of line and 33.5 miles of wire. The line poles are 30 feet long, of which there ar every other intersection, making them 1100 feet apart one way and 800 feet the other. Together there are 184 arc lam 19.0 amperes, 439.85 watts, or 1953 nominal candle power.

GHT PLANT, OWNED AND RUN BY THE CITY OF TOPEKA, KANSAS.

Cost of Carbons.	Cost of Globes.	Cost of Oil and Waste.	Cost of Repairs.	Expenses. Insurance. Telephone.	Pay Roll of Superintendent and Labor.	Interest on Cost of Plant, at 6 Per Cent.	Total Cost. Entire Expense per Month.	Cost per Lamp per Month.	Cost per Lamp per 100 Hours.
$110.07	$13.50	$22.15	$12.15	$32.88	$483.32	$277.24	$1,517.71	$8.25	$2.43
142.40	8.25	27.27	133.74	29.58	531.00	277.24	1,775.88	9.65	2.59
142.40	18.75	26.93	167.97	30.68	497.50	277.24	1,694.27	9.21	2.58
123.00	9.00	23.31	154.89	28.58	496.25	277.24	1,632.83	8.88	2.97
123.00	13.00	23.45	180.13	29.58	498.00	277.24	1,603.80	8.71	3.17
109.67	13.38	25.29	90.21	32.59	509.75	277.24	1,514.13	8.23	3.11
70.27	8.17	24.06	27.47	29.38	508.33	277.24	1,319.32	7.17	4.17
50.90	3.50	32.25	94.07	31.83	516.50	277.24	1,188.69	6.46	4.86
50.00	3.50	19.60	100.78	37.93	523.38	277.24	1,296.29	7.04	4.82
70.27	2.50	21.36	57.90	32.48	515.75	277.24	1,323.10	7.19	3.94
81.98	5.00	25.32	48.95	32.73	516.50	277.24	1,391.38	7.56	3.56
79.56	5.00	22.10	64.72	34.48	467.75	277.24	1,311.96	7.13	3.50
74.02	9.00	22.00	79.78	49.03	523.41	277.24	1,419.85	7.72	3.75
83.65	3.50	15.61	86.11	31.78	525.00	277.24	1,396.59	7.59	3.83
71.70	6.00	19.89	100.29	38.08	530.25	277.24	1,417.53	7.70	4.07
65.72	3.50	17.30	195.94	33.26	529.50	277.24	1,371.64	7.46	4.75
71.70	2.50	13.83	102.11	36.73	528.98	277.24	1,335.82	7.26	4.60
64.80	3.00	13.98	41.35	37.36	525.75	277.24	1,280.90	6.96	4.90
60.00	3.00	10.30	56.29	45.56	525.00	277.24	1,272.78	6.92	5.45
55.20	4.00	9.92	56.04	47.46	525.00	277.24	1,229.60	6.68	5.66
55.80	4.00	10.36	39.80	40.91	525.00	277.24	1,183.84	6.43	4.63
72.00	2.00	14.62	67.57	33.31	525.00	277.24	1,266.54	6.88	4.00
72.00	3.00	20.70	171.95	35.61	525.00	277.24	1,437.05	7.81	3.11
60.00	2.00	10.85	730.69	35.16	510.00	277.24	1,949.24	10.59	7.51
96.00	6.00	19.50	110.59	35.86	533.10	277.24	1,477.99	8.03	3.29
90.00	4.00	12.40	74.29	33.01	525.97	277.24	1,432.19	7.78	3.43
,146.11	$159.05	$504.35	$3,045.78	$905.84	$13,420.99	$7,208.24	$37,036.52	Av., $7.74	Av., $3.71
5.79	0.43	1.36	8.23	2.45	36.24	19.46	100.00		

st of plant, poles and wire, $46,888.65 ; total cost, $55,447.98.

nd three engines, worked up to 235-horse power ; there are six Jenney, Indianapolis arc dynamos of 30-lamp power each. hich there are 943. The lamps are suspended at the centre of the street intersections between two 40-foot poles, one lamp to e 184 arc lamps rated at 2000-candle power. An average test at the lamps showed a pressure of 23.15 volts and a current of

TABLE III. EXPENSES OF MUNICIPAL PLANTS.

ARC LAMPS.

City.	Total Cost of Plant, including Buildings.	Yearly Expenses.									
		Interest and Depreciation at 16 per cent.	Taxes and Insurance.	Superintendence and Labor.	Fuel.			Carbons.	Repairs.	Sundries.	Total.
					Kind.	Price per ton, cord, etc.	Cost.				
Aberdeen, Miss.	$10,000.00	$1,600.00	None given.	$1,320.00	Coal	$2.75	$750.00	$127.75	$100.00	$50.00	$3,947.75
Aurora, Ill.	18,831.56	3,013.05	$500.00	2,089.74	Soft coal	1.80	2,382.50	(*)	523.24	47.93	9,156.46
Bangor, Me.	34,141.01	5,462.56	None.	3,680.03	Water Power.			503.00	(†)	1,228.60	10,874.19
Bay City, Mich.	30,000.00	4,800.00	None.	4,220.00	Shavings	.....	1,429.79	518.34	321.72	363.05	11,652.90
Bloomington, Ill.	75,000.00	12,000.00	420.75	6,112.32	Coal	1.75	2,615.00	1,080.00	(†)	4,733.68	26,961.75
Danvers, Mass.	15,579.09	2,492.65	112.50	1,540.00	Coal	.....	557.09	258.40	(†)	362.80	5,323.44
Dunkirk, N. Y.	13,338.71	2,134.19	None given.	660.00	Coal	.....	1,190.07	333.00	160.35	443.96	4,921.57
Fairfield, Iowa.	5,000.00	800.00	None.	240.00	Coal	23.75	263.38	20.00	93.89	86.86	1,504.13
Goshen, Ind.	9,000.00	1,440.00	None.	960.00	Oil	.....	804.00	120.00	100.00	(‡)	3,424.00
Lyons, Iowa.	17,350.00	2,776.00	None.	1,855.81	Pine strips	0.90	900.00	243.71	440.63	280.07	6,196.22
Meadville, Pa.	20,000.00	3,200.00	56.00	2,280.00	Gas	.....	400.00	396.00	(†)	1,000.00	7,332.00
Ottawa, Ill.	16,000.00	2,560.00	25.00	2,200.00	Included in preceding.			700.00	400.00	(‡)	5,905.00
Paris, Ill.	10,500 00	1,680.00	None.	120.00	Coal	1.75	720.00	175.00	100.00	100.00	2 895.00
St. Joseph, Mo.	62,000.00	9,920.00	150.00	6,960.00	Coal	1.65	3,697.25	1,067.86	291.61	1,170.00	23,106.72
Sharpsburg, Pa.	5,725.76	916.12	None.	720.00	Gas	.....	480.00	153.00	120.00	(§)	2,389.12
Sherman, Tex.	10,000.00	1,600.00	None.	1,800.00	Coal	4.00	750.00	120.00	25.00	25.00	4,320.00
Topeka, Kans.	52,000.00	8,320.00	300.00	5,360.00	Coal	3.05	3,660.00	750.00	1,200.00	285.00	19,825.00
Xenia, Ohio.	18,500.00	2,960.00	20.00	1,800.00	Coal	2.20	1,525.00	350.00	250.00	850.00	7,755.00

* Included in fuel. † Included in sundries. ‡ Included elsewhere. § Included in repairs.

ARC AND INCANDESCENT.

Allegheny, Pa.	$175,000 00	28,000.00	$500.00	$25,000.00	Coal	$1 05	$8,000.00	$4,250 00	$3,500.00	$2,250.00	$71,500.00
Brainerd, Minn.	40,000.00	6,400 00	40.00	2,500.00	Water Power.			150.00	200.00	50.00	9,340.00
Galion, Ohio.	26,901.35	4,304.22	None.	1,641.50	Coal and oil	.....	2,180 86	250.00	50.00	1,190.00	9,616.58
Galveston, Tex.	39,990.00	6,398.40	None.	7,171.67	Slack coal / Coal	3.50 / 5.19	7,615.58	1,800.00	1,200.00	241.15	24,426.80
Herington, Kans.	30,000.00	4,800.00	None.	1,980.00	Coal	2.43	2,400.00	300.00	275.00	100.00	9,855.00
Statesville, N. C.	8,500.00	1,360 00	82.00	1,200.00	Wood	3.60	750.00	145.00	75.00	50.00	3,662.00
Vancouver, Wash.	17,000.00	2,720 00	None given.	3,612.00	Wood	.....	600.00	300.00	150.00	350.00	7,822.00

INCANDESCENT.

Charlton, Iowa.	$24,600.00	$3,936.00	$50.00	$2,080.00	Slack coal	$0.50	$1,500.00	(†)	$125.00	(†)	$7,691.00
Falls City, Nebr.	9,000.00	1,440.00	None.	2,050.00	Coal	2.65	(*)	(*)	(*)	(*)	3,490.00
Tecumseh, Nebr.	7,000.00	1,120.00	30.00	1,000.00	Coal	3.25	300.00	60.00	40.00	10.00	2,560.00

* Included in superintendence. † Included elsewhere.

the District of Columbia,[1] it has been placed at 10 per cent of the total investment for both plant and buildings. It seems to me that, even accepting that assumed ratio, the expenditures for current repairs ought to be deducted from the item.

Having thus obtained an approximately accurate expense account, the problem of ascertaining the annual cost per lamp becomes apparently simple. All that is necessary is to divide the total by the number of lamps operated. The results of the Electrical Commission are shown in Table IV.

We have here not only the cost per lamp per year, but also the cost per hour. The cost per hour is utterly worthless for any scientific use. The number of hours of lighting is too fluctuating a figure; the greater the number of hours the less the apparent cost per hour. If variations in the duration of nightly lighting vitiates to a certain extent the cost statistics per lamp per year, the variations in the number of hours take away every vestige of value from the figure representing the cost per hour. Furthermore, many of the limitations noted with respect to contract prices apply equally to the cost under municipal ownership. The municipality is usually circumscribed in its market; it is seldom permitted to sell its product to private consumers. It is likewise subject to the same influences as accrue to private companies from differences in the locations of lamps and wires.

III. General Comparisons.

Our examination of the nature of the statistics at hand being completed, we must next inquire how far these statistics may be used for purposes of general comparison. This question in reality resolves itself into how far we may rely upon a simple average of the results. Can we say that a specific contract price is so much below or so much above the average price paid by American municipalities? Can we say that the cost in a designated city is so much below or so much

[1] 52nd Cong., 1st Sess., House Ex. Doc. No. 15.

TABLE IV. COST PER LAMP UNDER MUNICIPAL OWNERSHIP.

ARC LAMPS.

City.	Number of Lights.	Hours of Lighting.		Cost per Lamp.	
		Per Day.	Per Year.	Per Year.	Per Hour.
Aberdeen, Miss.	35	8	2,920	$112.79	$0.0386
Aurora, Ill.	83	7h 10m	2,622	110.32	.0421
Bangor, Me.	146	(*)	3,600	74.48	.0207
Bay City, Mich.	141	.....	2,221	82.64	.0372
Bloomington, Ill.	220	.....	2,247	122.55	.0545
Danvers, Mass.	75	4.847	1,769	70.98	.0401
Dunkirk, N. Y.	60	10h 51m	4,000	82.03	.0205
Fairfield, Iowa.	10	3.5	1,278	150.41	.1177
Goshen, Ind.	31	9.75	3,550	110.45	.0310
Lyons, Iowa.	59	7	2,555	110.11	.0431
Meadville, Pa.	70	8	2,920	104.74	.0393
Ottawa, Ill.	100	.....	3,600	39.05	.0167
Paris, Ill.	60	(†)	3,000	48.25	.0161
St. Joseph, Mo.	253	8	2,920	91.33	.0313
Sharpsburg, Pa.	35	8	2,920	68.26	.0234
Sherman, Tex.	43	7	2,555	100 47	.0393
Topeka, Kan.	184	(‡)	3,600	107.74	.0299
Xenia, Ohio.	80	(†)	3,300	97.74	.0326

* Dark to daylight. † Moon schedule. ‡ All dark hours.

ARC AND INCANDESCENT.

City.	Number of Lights.	Hours of Lighting.		Gross Cost per Lamp (Arc).		Receipts (from Rented Lamps).	Net Cost per Lamp (Arc).	
		Per Day.	Per Year.	Per Year.	Per Hour.		Per Year.	Per Hour.
Allegheny, Pa.	Arc. 422 Incandescent. 2,500	11 24	....	$106.40	.....	None.	.....	.....
Brainerd, Minn.	Arc. 30 Incandescent. 1,000	} 4.75	.....	71.85	.....	None given.	.....	.....
Galion, Ohio.	Arc. 71 Incandescent. 600	} 10	.....	73.41	.....	$2,270.00	$56.22	.....
Galveston, Tex.	Arc. 175 Incandescent. 300	} 9	.....	114.28	.....	None.	.....	.....
Herington, Kan.	Arc. 20 Incandescent. 500	} 5	.....	140.79	.....	4,200.00	80.80	.....
Statesville, N. C.	Arc. 30 Incandescent. 220	Dark. 6	....	70.42	.....	None given.	.....	.....
Vancouver, Wash.	Arc. 35 Incandescent. 540	} 12	.....	87.89	.....	None given.	.....	.....

INCANDESCENT.

City.	Number of Lights.	Hours of Lighting.		Gross Cost per Lamp.		Receipts (from Rented Lamps).	Net Cost per Lamp.	
		Per Day.	Per Year.	Per Year.	Per Hour.		Per Year.	Per Hour.
Chariton, Iowa.	1,300	12	4,380	$5.92	$0.00135	Not given.	.....	.....
Falls City, Neb.	400	4	1,460	8.73	.00599	$2,085.00	$3.51	$0.00240
Tecumseh, Neb.	500	5	1,825	5.12	.00281	1,680.00	1.76	.00096

above the average cost of electric lighting under municipal ownership? If we can say so, then why not compare these two averages and thus learn which method of public lighting is less expensive,— that by contract with private parties or that of municipal ownership? All this has been done time and time again,[1] yet I have met but one argument in its support. It is claimed that all a city wants is to have its streets lighted. If it can get along with less illumination than its neighbor, so much to its advantage. If under municipal ownership a city does with less light than under private contract, it simply means that private companies force more light upon the cities under that régime than they require. The average represents annual illumination. Annual illumination is a concrete thing capable of comparison, and therefore a comparison of averages is a comparison of like things.

Such argument, I maintain, is merely specious. The many limitations and differentiating factors, which I have enumerated, preclude any comparison of averages whatever. In this case the average represents nothing. Unlike elements may produce the same cost statistics, and the same cost may represent totally different conditions. If the defective factors were in both instances the same, they might possibly be eliminated by combination and permit of a general use. Here this is not the case. The average is fictitious through and through.

It has sometimes been attempted to compare the cost of electric lighting in the same city under contract with private companies and under municipal ownership. Figures of this kind are valid so far as they go. But even where the city changes from one régime to another, by buying out the private corporation, or by constructing its own plant, we can never be certain that the conditions remain unchanged, that we are comparing similar services. Mr. R. J. Finley has, in

[1] I confess to have made this mistake once in my first essay on this subject, published in the *Independent*, March, 1889. The same error is found in Mr. Fransisco's *Municipal Lighting*, in the report of the Engineer Commissioner cited, and in Mr. Finley's article in the *Review of Reviews*, February, 1893; also in the *Census Bulletin*, and others.

a recent magazine article, adopted still a different procedure. He has compiled two tables representing the two systems, each table showing the cost of lighting in a number of cities specially chosen with reference to geographical situation and industrial conditions, in order to counterbalance the one against the other. The plan is ingenious. Sufficient data are given to convey a comprehensive idea of the situation, but Mr. Finley also gives way to the irresistible impulse to generalize with an average. His average, like the others, is misleading and meaningless.

If this review of the cost statistics of public electric lighting can serve any useful purpose, it must be to emphasize the fact that in such matters simplicity is deception. It is useless to seek to represent a complicated process by a single numerical figure. The statistics themselves are valuable, but must be employed as bases of comparison only with the utmost care, and with due allowance for the many limitations which affect their accuracy.

VICTOR ROSEWATER.

IMMIGRATION AND THE FOREIGN BORN POPULATION.

By Prof. Richmond Mayo-Smith.

The population of the United States from 1880 to 1890 increased 24.86 per cent. The foreign born element of the population increased during that period 38.47 per cent. The increase of this latter element goes on under peculiar conditions. It is not the natural increase of the foreign born who were here in 1880. On the contrary, the natural increase of the foreign born goes to swell the number of the native born. Neither is it the natural increase of the immigrants who came here during the period 1880 to 1890. Their natural increase goes also to swell the number of the native born. The increase is due entirely to immigration. Still further, this immigration must be sufficiently strong to overcome the decrease among the foreign born by all the deaths during the decade, the decrease among the immigrants by death after their arrival, and the loss by emigration. We have therefore in this case a very peculiar problem. That the increase has been so large shows an enormous immigration, or, on the other hand, a very slight diminution by deaths and by emigration. It is a matter of considerable interest to determine the relative value of these three factors, viz., the strength of immigration, the loss by emigration, *i. e.*, the return of immigrants to their old home, and the decrease by deaths.

The elements in this problem are some of them known and some of them unknown. We know of course the number of the foreign born in 1880 and 1890. We know still further the immigration for each year during the decade. The points to be determined are the emigration from this country, and the death rate among the foreign born and the immigrants.

The object of the following paper is to inquire whether these last two figures can be determined with any degree of approximation. It would be extremely interesting to know accurately both facts, viz., the number of immigrants who, instead of remaining in this country, decide to return home; and the mortality rate among these new citizens. The first fact is necessary in order to judge of the influence of immigration upon the growth of population in the United States. The second fact would throw light on the question of the relative increase of foreigners and natives in this country, and especially whether the foreigners are crowding the natives out. It would also have a sociological interest in determining the effect of change of environment upon different nationalities.

The statistical data for the solution of this problem seem to be the following: —

In 1880 the number of the foreign born in the United States was 6,679,943. During the decade 1880 to 1890 the number of immigrants to the United States was 5,246,613. The two together make 11,926,556. This represents the number of foreign born persons who should have been here in 1890 if there had been no emigration and no deaths. The Eleventh Census gives the actual number of foreign born here in 1890 as 9,249,547. This leaves us with 2,677,009 to account for by emigration and by deaths.

Let us take up first the question of emigration. We have no official statistics of the number of emigrants leaving the United States. The Bureau of Statistics of the Treasury Department is accustomed to print in the annual Reports on Commerce and Navigation of the United States an estimate, made on the basis of returns from the principal shipping lines, of the number of passengers departing from the United States. Among these it is impossible to distinguish United States citizens going abroad, foreigners who have simply been travelling in this country and who are returning home, and emigrants who are leaving this country permanently. It is evident, however, that if for a series of years we take the

total number of passengers arriving in this country and deduct the total number of passengers departing from it we shall get at approximately the net immigration, *i. e.*, the number of foreigners who come and remain here. For the United States citizens who are among the passengers departing sooner or later reappear among the passengers arriving in this country. So also the travellers from foreign countries, who figure among the passengers arriving in the United States, upon their return figure among the passengers departing from the United States. Such a series of figures would not give us the net immigration for any single year, but for a considerable period of time the result would be correct.

On this basis the net immigration to the United States for the decade 1880 to 1890 is shown in the following table:—

TABLE SHOWING THE TOTAL NUMBER OF PASSENGERS DEPARTING FROM, AND THE TOTAL NUMBER OF PASSENGERS ARRIVING IN, THE UNITED STATES FOR EACH YEAR ENDING JUNE 30, 1881, TO 1890.

Year Ending June 30.	Passengers Arriving.	Passengers Departing.	Net Immigration.
1881	743,712	112,072	631,640
1882	869,144	133,496	735,648
1883	712,515	157,954	554,561
1884	649,491	187,706	461,785
1885	535,009	243,890	291,119
1886	444,303	201,293	243,010
1887	605,385	193,897	411,488
1888	663,039	211,212	451,827
1889	546,513	239,557	306,956
1890	564,442	238,139	326,303
Total.....	.....	.....	4,414,337

According to this estimate the total net immigration to the United States during the ten years was 4,414,337. The total gross immigration having been 5,246,613 the net loss by emigration seems to have been 832,276. This would seem to show that 15.86 per cent of the total number of immigrants to this country sooner or later return home. It is evident,

however, from observation, that the tendency to emigrate varies with different nationalities. Our returns of passengers departing do not distinguish the nationality of the passengers, so that we shall have to content ourselves with this general figure without going into details.

Such being the fact in regard to loss by emigration we turn to the second question of the probable loss by deaths. This is an even more difficult question.

Our vital statistics for the United States are not very trustworthy. Dr. Billings, in his investigation of 1880, made out a death rate for the United States of 15 pro mille. By comparison with the registration in certain states he was led to believe that there was a deficiency in the number of deaths reported varying from 15 to 30 per cent. In view of this comparison, he was led to raise the death rate 20 per cent, making it 18 pro mille for the whole population. We do not know now whether the mortality among the foreign born is the same as that among the whole population or not. But even were the mortality the same the death rate would not be the same, for the foreign born have a much more favorable distribution by age than the whole population. On the basis of the death rate for the whole population by age classes given in Vol. xi, page xxv, of the Tenth Census, and the distribution of native and foreign born persons in age classes given in Vol. xii, page ciii, of the Tenth Census, I have calculated that if the mortality be the same among the foreign born as among the whole population the foreign born have a death rate of 13.44. Raise this by 20 per cent, as Dr. Billings has done for the general death rate, and we have a death rate for the foreign born of 16.12 pro mille.

We must consider still further the death rate among the immigrants after their arrival here. They have a different and even more favorable age distribution than the foreign born. Proceeding by the same method as before, I calculate that if the immigrants, after their arrival in this country, have the same mortality as the whole population the death

rate among them will be 11.6. Raise this by 20 per cent, as before, and we have a death rate for the immigrants of 13.92 pro mille. Taking the average between the death rates of the foreign born and of the immigrants we have a death rate for the two classes of about 15 pro mille.

Some objection may be raised to this calculation on the ground that the foreign born population which started in 1880 with the death rate of about 16 would be constantly increasing in age, so that its death rate should be constantly increasing. To offset this it may be said that even after ten years the greater part of this population (65 per cent) would still be under the age where the mortality approaches 16 pro mille. Still further, that the younger part of this population would be constantly approaching an age where the mortality was less. The same fact would be true of the immigrants. While we allow them a death rate of 15 pro mille, the majority of them, during the whole period after their arrival, would be of an age (say from 15 to 30) where the death rate is very much less.

On the basis of this net immigration, and with a probable death rate of 15 pro mille, I have made the following calculation: Starting with the foreign born population of the United States in June, 1880, I have allowed a death rate of 15 pro mille, and at the end of the year have added the immigration of the year ending June 30, 1881. With this population I have continued, allowing a death rate of 15 pro mille, and adding at the end of the year the immigration for the year ending June 30, 1882. Continuing this process the survivors of the foreign born and of the immigrants should have been in 1890 9,825,727. This still leaves a deficiency of 576,180. There should be added to this deficiency the immigration overland, which does not enter into the returns of our Treasury Department after July 1, 1885. From the reports of the Minister of Agriculture of Canada we learn that during the period from July 1, 1885, to July 1, 1890, there passed through Canada, en route for the United States, not less than 379,942

immigrants; allowing for these a death rate of 15 pro mille, the survivors in 1890 would number 368,186. These must be added to the former number, making a total deficiency of 944,366.

How shall we account for this great deficiency? It may be due to one or all of four causes. It may be that the death rate among the foreign born is greater than 15 pro mille. It may be that the emigration is greater than that which we have allowed for. It is barely possible that some of the foreign born persons may have declared themselves in the Census to have been native born. Or, finally, the enumeration of the foreign born, at the Eleventh Census, may have been defective. In regard to the last two causes I do not know that we have any evidence accessible to prove or to disprove them. It will repay us to examine a little more closely the first two.

In regard to the probable death rate we may extend the inquiry in the following direction: In Bulletin No. 357 of the Eleventh Census we have the foreign born by nationalities in 1880 and 1890. From the reports of the Treasury Department Bureau of Statistics we have the gross immigration for each year by nationalities. If now we can find a nationality where there is not much probability of emigration or of defective enumeration, we shall be able to calculate the loss by death during the ten years. We seem to have such a case in the Russian and Polish Jews. These persons driven from Russia by persecution have no inducement to return; hence, probably all that have ever come to this country are either here now or have died here. Still further, owing to peculiarities of race and language it is not probable that the Census has returned them either as native born or as belonging to some other nationality. Here, therefore, we have a case where we can test our assumed death rate.

In 1880 the number of Russians and Poles in this country was 84,279; during the ten years from 1880 to 1890 the number of immigrants from Russia and Poland was 265,088. The

two together make 349,367. The number of Russians and Poles in the Eleventh Census was 330,084. This shows the extraordinarily small deficiency of 19,283. We find now by calculation that a death rate of only 11 pro mille will account for this deficiency. In this case, therefore, we have a much lower death rate among the foreign born after their arrival in this country than among the other classes of the population. It is also to be noticed that among the Russian and Polish Jews there is a larger proportion of children (26.2 per cent instead of 20.9 per cent) than is usual among immigrants, owing to the fact that persecution drives whole families abroad. It must also be noticed that these Jews belong very largely to the poorest and most destitute classes, that they are crowded together in the tenement houses of large cities, that they are subject to excessive hours of labor, and that their sanitary condition is such as to bring about a high death rate rather than a low one. On the other hand, it is true that the Jews generally have a low mortality rate. Dr. Billings, in his special investigation of 16,000 Jewish families in this country, found a death rate of only 7.1 pro mille; and in 1889 the highest death rate he allowed was less than 10 pro mille. But even taking this fact into consideration the indication seems to be that the death rate of 15 pro mille, which we have allowed for the immigrants, is sufficiently large.

We have no other nationality which gives us so satisfactory a result as the one just mentioned, because in no other case can we assert that there is little or no emigration. An almost parallel case would seem to be that of the Norwegians and Swedes. They are a sturdy race who settle very largely on farms in the West, and their death rate would probably be low. I have no means of ascertaining whether the Norwegians and Swedes are inclined to return home, but I judge that this emigration cannot be very large. For these immigrants we have the following figures: —

Norwegians and Swedes here in 1880,	376,066
Norwegians and Swedes immigrants, 1880 to 1890,	568,362
Total,	944,428
Norwegians and Swedes here in 1890,	800,706
Deficiency,	143,722

If we allow a death rate of 15 pro mille during the period 1880 to 1890, the survivors in 1890 should have been 851,407. This leaves still a deficiency of 50,701, or 8.92 per cent, of the immigration of the decade to be attributed to emigration. This does not seem to be excessive. Allowing a death rate of 20 pro mille, the survivors in 1890 would have been 822,686, leaving a deficiency of 21,980, or 3.86 per cent, of the immigration.

There is one other nationality about which we have some special information. The British Board of Trade gives both the emigration and the immigration of persons of British and Irish origin. From this we can ascertain the net emigration to the United States of persons of British and Irish origin. This number would not be exact for any single year, but for a series of years it would give the net emigration. For the ten calendar years, 1881 to 1890, this net emigration amounted to 1,168,516. According to the United States statistics the number of immigrants of British and Irish origin was 1,462,-839. This would seem to indicate a return movement of British and Irish from the United States of 294,323, or 20.4 per cent of the gross immigration, which does not seem excessive. Taking, now, this net immigration we have the following calculation: —

British and Irish foreign born in United States, 1880,	2,772,169
British and Irish immigration, net,	1,168,516
Total,	3,940,685
Total British and Irish foreign born, 1890,	3,122,911
Deficiency,	817,774

This deficiency represents death among the foreign born of 1880 and the immigrants, during the ten years. But in order to account for this deficiency we require a very large death rate, as follows: —

Death Rate.	Number in 1890 should have been	Deficiency.
With death rate 15 pro mille.....	3,469,650	346,739
" " " 20 " "	3,325,502	202,591
" " " 25 " "	3,187,379	64,468
" " " 30 " "	3,055,041	(Surplus) 67,870

With a death rate of 15 pro mille we have therefore a deficiency of 346,739, even taking only the net immigration.

It will be interesting to continue our inquiry to the other nationalities of which we have the record. We will present for each nationality a little table giving the foreign born of 1880, the immigration during the ten years, the foreign born of 1890, the deficiency, the number of survivors, allowing a death rate of 15 pro mille, and the deficiency after allowing such death rate.

GERMANY.

German born (United States, 1880), ...	1,966,742
German immigration, 1880 to 1890 (gross), ...	1,452,970
Total, ...	3,419.712
German born, 1890, ...	2,784,894
Deficiency, ...	634,818

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	3,029,887	244,993	16.86
" " 20 " "	2,910.215	125,321	8.62
" " 25 " "	2,795,362	10,468	.....

In the case of Germany, with a death rate of 15 pro mille, we have only a moderate deficiency, which can easily be accounted for by a return movement of less than 17 per cent of the immigration. Such a return movement does not seem at all unreasonable, so that in this case we should say that the statistics were probably correct. It is to be observed that this return movement is less than the return movement of the British and Irish, which we discovered by comparing the British and American statistics. With a death rate of 20

pro mille (which is possible, as the German immigration is much of it of old date) the return movement is represented by only 8.62 per cent.

DENMARK.

Foreign born in United States, 1880 (Denmark),	64,196
Danish immigration, 1880 to 1890,	88,132
Total,	152,328
Foreign born in United States (Denmark),	132,543
Deficiency,	19,785

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	137,419	4,876	5.53
Death rate 20 pro mille.....	132,821	278	....

The Danish statistics are evidently very near the truth, for the slight deficiency of 5.53 per cent may be easily attributed to emigration.

The countries thus far treated have given us but little difficulty. The other nationalities show a much larger deficiency.

AUSTRIA, INCLUDING BOHEMIA.

Austrian foreign born in United States, 1880,	124,024
Austrian immigration, 1880 to 1890,	226,038
Total,	350,062
Austrian foreign born in United States, 1890,	241,377
Deficiency,	108,685

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	319,532	78,155	34.57
Death rate 20 pro mille.....	310,089	68,712	30.40

It is evidently useless to continue this table any further, for it would require an altogether impossible death rate to account for the deficiency. With the ordinary death rate of 15 pro mille there would seem to be a return movement of over one-third of the Austrian-Bohemian immigration. This seems to me very large.

HUNGARY.

Foreign born (Hungary) in United States, 1880,	11,526
Immigration (Hungary), 1880 to 1890,	127,681
Total,	139,207
Foreign born (Hungary) in United States, 1890,	62,435
Deficiency,	76,772

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille	130,568	68,133	53.36
Death rate 20 pro mille	127,848	65,413	51.23

In the case of Hungary, even allowing a death rate of 20 pro mille, there is still a very large deficiency. This would indicate an enormous migratory movement on the part of these people, corresponding perhaps to the general impression that a good many Hungarians come here to stay a short time with the intention of returning home.

ITALY.

Foreign born in United States, 1880,	44,230
Immigration (Italian), 1880 to 1890,	307,309
Total,	351,539
Foreign born (Italy) in United States, 1890,	182,580
Deficiency,	168,959

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille	328,820	146,240	47.58
Death rate 20 pro mille	321,695	139,115	45.26

In the case of Italy, also, even with a death rate of 20 pro mille, we have a very considerable deficiency. It is the common impression, however, that a great many Italians return home. This is partly confirmed by the Italian statistics, which give the number of Italians returning to Italy, third class, from the United States, as 4734 in 1889, 2859 in 1890, and 10,265 in 1891. These statistics have been collected only during the last three years, and it seems possible that the figures for 1891 may be nearer the truth than those for the preceding years.

FRANCE.

Foreign born (French) in United States, 1880,	106,971
Immigration, 1880 to 1890,	50,464
Total,	157,435
Foreign born (French) in United States, 1890,	113,174
Deficiency,	44,256

It is evidently useless to calculate the deficiency with any ordinary death rate in the case of the French. The emigration almost equals the immigration, so that the increase of the number of French in the United States is very slow. This has been true ever since 1860. From 1860 to 1870 the increase among the French foreign born was only 6532. From 1870 to 1880 there was an absolute decrease of 9431. From 1880 to 1890 there was an increase of 6203. This corresponds, therefore, to past experience, and seems to confirm the common notion, that the French always desire to return some day to France.

The smaller countries of Europe are not very important in this question, but we will carry out the same calculation for them.

HOLLAND.

Foreign born (Dutch) in United States, 1880,	58,090
Immigration (Dutch), 1880 to 1890,	53,701
Total,	111,791
Foreign born (Dutch) in United States, 1890,	81,828
Deficiency,	29,963

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	99,769	19,941	37.13
Death rate 20 pro mille.....	96,078	14,250	26.53

BELGIUM.

Foreign born in 1880,	15,535
Immigration, 1880–90,	20,177
Total,	35,712
Foreign born, 1890,	22,639
Deficiency,	13,073

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
With death rate 15 pro mille...	32,411	9,772	48.42
With death rate 20 pro mille...	31,401	8,762	43.42

SWITZERLAND.

Foreign born in 1880,	88,621
Immigration, 1880–90,	81,988
Total,	170,609
Foreign born, 1890,	104,069
Deficiency,	66,540

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	152,169	48,100	58.67
Death rate 20 pro mille.....	146,451	42,382	51.69

In order to judge, now, whether these deficiencies may reasonably be accounted for by a return movement of emigration, I have arranged the following table: —

TABLE SHOWING THE EMIGRATION NECESSARY TO ACCOUNT FOR THE DEFICIENCY IN THE STATISTICS, ALLOWING A DEATH RATE OF 15 PRO MILLE.

Country.	Deficiency.	Percentage of Immigration.	Annual Emigration Necessary.
Russia and Poland.....	None.	None.	None.
Denmark.....	4,876	5.53	487
Norway and Sweden.....	50,701	8.92	5,070
Germany.....	244,993	16.86	24,499
Great Britain and Ireland.....	626,706	42.84	62,670
Austria (including Bohemia).....	78,155	34.57	7,815
Hungary.....	68,133	53.36	6,813
Italy.....	146,240	47.58	14,624
Holland.....	19,941	37.13	1,994
Belgium.....	9,772	48.42	977
Switzerland.....	48,100	58.67	4,810

I have omitted from this table France on account of the peculiar character of French migration. Remembering now that we have ascertained from two other and independent

sources that the return movement of emigration is probably from 16 to 20 per cent of the immigration, and taking into consideration the facts of observation in regard to various nationalities, we ought to be able from this table to form some opinion upon the question of how the deficiency is to be accounted for.

France we omit from consideration, as just said. Belgium, with a deficiency of 48.42 per cent to be accounted for, is very likely in the same position as France.

Russia and Poland, Norway and Sweden, and Denmark present no difficulty, the deficiency being so small.

Germany (deficiency 16.86 per cent), it is reasonable to suppose, is about correct, for a slightly increased death rate and a moderate emigration would account for the deficiency.

Italy (with a very large deficiency, 44.61 per cent) may be accounted for by a large death rate, which is not improbable, considering the habits and condition of Italian immigrants, accompanied by the large emigration which is commonly supposed to exist. It is barely possible that similar causes may be at work among the Austrians and Bohemians, which would account for the large deficiency (34.57 per cent) among them.

Hungary presents so large a deficiency (53.36 per cent) that it seems to me difficult to account for it on the same theory. It is true that there may be a heavy death rate among these people, and it is also commonly supposed that many of them return. It must also be remembered that many of the Hungarians live in remote mining districts, where they might easily have escaped enumeration.

Holland and Switzerland are to me inexplicable.

But the most serious case is that of the British and Irish. Taking only the net immigration there is a deficiency of nearly 30 per cent. Taking the gross immigration, in order to compare them with the other nationalities, there is a deficiency of 42.84 per cent. It must be remembered, too, that this does not include the immigration of British and Irish by

way of Canada, which must be large. There seems to be no reason why we should assign to the British and Irish a larger death rate than 15 pro mille. On the other hand, it seems to me impossible to believe that from 40 to 50 per cent of the British and Irish immigrants are accustomed to return home. Such a movement as that would inevitably have attracted attention. Two other solutions of the difficulty present themselves. One is that the Irish living in the crowded tenement-house district of large cities and in factory towns, where both men and women are absent from home during the day, and many of the British and Welsh being, like the Hungarians in somewhat remote mining districts, the enumeration of these two classes may have presented unusual difficulties. The other consideration is that the British and Irish both speaking English it may have been difficult to distinguish them from the native born. This would have been especially the case in families where some of the children were born before and some after the parents came to this country. It is barely possible, therefore, that a portion of these British and Irish may be found among the native born of foreign parentage.

It is possible to continue the analysis by distinguishing between the Irish, the Scotch, and the English (including the Welsh and British not specified). Following out our old method we have the three following tables: —

IRELAND.

Irish born, here in 1880,	1,854,571
Irish immigration (gross), 1880 to 1890,	655,482
Total,	2,510,053
Irish born, here in 1890,	1,871,509
Deficiency,	638,544

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	2,212,870	341,361	52.07
Death rate 20 pro mille.....	2,112,315	240,806	36.73

ENGLAND (INCLUDING WALES AND GREAT BRITAIN NOT SPECIFIED).

Foreign born in United States, 1880,	747,462
Immigration, 1880 to 1890,	657,488
Total,	1,404,950
Foreign born in 1890,	1,009,171
Deficiency,	395,779

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	1,257,303	248,132	37.73
Death rate 25 pro mille.....	1,211,904	202,733	30.83

SCOTLAND.

Foreign born in United States in 1880,	170,136
Immigration, 1880 to 1890,	149,869
Total,	320,005
Foreign born in 1890,	242,231
Deficiency,	77,774

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	286,864	44,633	29.78
Death rate 20 pro mille.....	276,671	34,440	22.98

It seems from this calculation that, allowing a death rate of 15 pro mille, we have in the case of the Irish a deficiency of 52.07 per cent, of the English and Welsh 37.73 per cent, and of the Scotch of 29.78 per cent. In the case of both the English and Scotch the deficiency is very large, but may be partly explained by the migratory habits of these people, who may very likely, after coming to the United States, pass into Canada or to Australia. In the case of the Irish the deficiency is astonishing, and brings about the result that, notwithstanding an immigration of 655,482 during the decade, the Irish born population of the United States increased less than 1 per cent. In view of the fact that the population of Ireland is constantly decreasing, it seems to me impossible to believe that anything like this number of Irish return to their former home. This deficiency, therefore, can only be explained by the suggestions mentioned above.

If we allow a greater death rate, say 20 pro mille, the

deficiency in most of the countries is still very large, as is shown by the following table: —

TABLE SHOWING THE EMIGRATION NECESSARY TO ACCOUNT FOR THE DEFICIENCY IN THE STATISTICS, ALLOWING A DEATH RATE OF 20 PER MILLE.

Country.	Deficiency.	Percentage of Immigration.	Annual Emigration Necessary.
Russia and Poland	None.	None.	None.
Denmark	None.	None.	None.
Norway and Sweden	21,980	3.86	2,198
Germany	125,321	8.62	12,532
Great Britain and Ireland	477,988	32.67	47,798
England and Wales	202,733	30.83	20,273
Scotland	34,440	22.98	3,444
Ireland	240,806	36.73	24,080
Austria (including Bohemia)	68,712	30.40	6,871
Hungary	65,413	51.23	6,541
Italy	139,115	45.26	13,911
Holland	14,250	26.53	1,425
Belgium	8,762	43.42	876
Switzerland	42,382	51.69	4,238

In conclusion I would say that, although this investigation does not seem to lead to very precise results, yet it may be of value in the following directions: —

(1) These differences which we have discovered among the different nationalities may serve to confirm the results as to mortality among the foreign born, which it is supposed will be presented by Dr. Billings in the mortality statistics of the Eleventh Census.

(2) The investigation may serve to show that the census enumerators, in the case of certain classes of the population, meet with peculiar difficulties in getting complete returns. This is not intended as in any sense an attack upon the integrity of the Eleventh Census, but as pointing out those cases where any enumeration is apt to be incomplete.

(3) This investigation may be of sociological interest in showing that the character of the immigration from different countries varies greatly. The question whether immigration is permanent or temporary must be of great importance in judging of the influence of that immigration both upon population and upon social institutions.

THE VALUE OF PERCENTILE GRADES.

By Luther Gulick, M.D.

Read before the American Statistical Association, Feb. 10, 1893.

This paper might be called with greater propriety "A criticism of a certain use of the Percentile Grade system."

It is with considerable diffidence that I present this paper to you, as I am aware of the blunders which novices so commonly fall into, errors which might easily have been avoided had the work been done by those more experienced, or having had better training. I am keenly conscious that there are few fields which offer more hidden traps for unwary feet than does that of statistical study. I venture, however, as it seems that there are few others who are at work on just this phase of these problems, and I feel sure that your discussions will show errors that I, as well as others, may avoid in the future.

In estimating the value of work one must bear in mind the end for which it is done. The ends for which I have used Percentile Grades, and on which alone I can judge as to their value are,—

First, to show as far as may be the bony and muscular form, function, growth, and proportions of homogeneous wholes, individuals, and classes as compared to each other, and also to make comparison between the different items in the whole, the class, and the individual. I use the term "homogeneous wholes," for it is unnecessary to explain that only such can be tabulated to any purpose. Thus, it would be of no value (for the purpose which I have mentioned) to tabulate the measurements of men and women together.

Second, to ascertain if possible those proportions and functions of the body which should be sought after.

Third, to awaken and maintain interest in physical exercise among those who need it.

It will thus be seen at once that I exclude the ends for which the percentile grade system was designed, and for which it is surpassingly useful and reliable. I write simply from the standpoint of a teacher of physical education, who has used this method in the endeavor to secure certain definite results bearing on his work. The second aim is the one to which most particular attention has been directed.

During the past six years we in this country have been treated to a flood of anthropometric data, which if carefully prepared would have been proved sufficient to put the whole subject on a far advanced plane. It is to be regretted, however, that nearly all that has been done in this direction has been done without careful attention to method. The method which of late has been attracting the most attention is what seems to me an unjustifiable use of percentile grades. This scheme has been put to uses which not merely do not represent facts, but disproves them, and proves falsities to be true.

This method of statistical study in anthropometry has been adopted by our largest colleges, and has carried all before it. We have all been in the habit of having our measurements taken, then, and plotted on a chart, thus producing a line which purported to be a comparison of ourselves in all these different items with the normal standard, and which would enable us to compare each part of our body with every other part, in order to distinguish which parts were deficient. The whole being designated to stimulate us in our endeavors to acquire symmetrical forms according to this standard.

No explanation has ever been given as to why this method should show these standards, nor, as far as I know, have any questions been asked in this direction. Coming from such eminent sources it has swept all things before it, and blinded the eyes of all who might otherwise have felt inclined to examine it more critically.

We have before us a percentile chart. It is constructed

as follows: A large number of different individuals are measured uniformly. These measurements are then sorted and arranged in rows under each item so that the highest shall be at one extreme, the lowest at the other. Sometimes this is done by making piles of the cards on which the measurements have been taken. This, it seems to me, is a cumbersome method, and does not afford opportunity for adding to these lists, nor verifying them at a later time. But, by arranging them in tabular form in a book, and making a dot for each measurement, these difficulties are overcome. Let us say that we have ten thousand individuals from whom the chart is to be constructed, and that we have already arranged them in the way mentioned. We are now working, we will say, on Girth of Head. Counting one hundred from the lower end, we find that the one-hundreth card reads 525 M. We then set down this figure immediately after Girth of Head and mark it one per cent. This means that out of the ten thousand individuals one hundred, or one per cent, are either equal to or smaller than that figure. We then count off four hundred more, making a total of five hundred, find our figure 534, place it next beyond one per cent, and label it five per cent. We count five hundred more, coming to 540. This is ten per cent of the whole; we put this down, and so we go on making the divisions or the per cents as large or as small as we please. We take next Breadth of Head, and treat it similarly, placing the figures directly beneath Girth of Head, so that the one per cents come in the same column. We thus get all the measurements of the body, or measurements of the individual. We include not merely linear measurements, but all which are capable of numerical representation, such as strength, as shown by the dynamometer, capacity of lungs, and the like. We now have a percentile chart, and any given horizontal set of figures is a set of percentile grades, and forms a percentile class.

This method of construction is the one in most common use, but is less accurate than that proposed by Mr. Francis

Galton. To use this chart we take the measurements of an individual in all the usual items, and make dots on the chart which correspond to the measurements of the individual in that item. We then connect these dots by a line This produces a more or less broken line, which represents the absolute measures of the individual, and which purports to represent his relations to the standard, and the relation of his parts to each other. Thus it is taken for granted that if a man's height falls under the twenty-five per cent class his weight should also fall there, the girth of his chest, and so on. The individual measured is now supposed to take this chart and endeavor to straighten his line. If the chest girth does not correspond with the rest of his line, he is to bring it up, if possible, to the standard by breathing exercises.

This scheme is on its face delightful, for it does away with the assumed fallacy that all should be the same height. In a measure it appears to make every man his own standard, so that a man's forearm shall be in proportion to his wrist, and not to that of some one else, and it gives us a convenient way of representing the relation of the individual to the whole.

Instead of taking an individual and thus plotting him, as it is called, we can take the mean measures of a class and plot them, showing how this class compares to this standard which has been secured.

We have now constructed our percentile table, and we have before us the percentile grades concerning whose value we are inquiring. We are told that the fifty per cent is identical with the mean. *By mean I refer to the value of a perpendicular in a binomial curve, which arising from its base extends to its summit.* Thus, *where there is no binomial curve there is no mean.* The mean involves the operation of the law of variation.

This percentile scheme, however, can be worked out for any class of objects whatever, whether they correspond or not to the law of variation. Thus we can get the percentile heights of all the chairs in this room, but it is highly improb-

AN ANTHROPOM

CONSTRUCTED ON THE

Compiled from 2230 measurements of Amherst College students between 1884

Figures indicate Millimeters, Kilograms, Litres, and Units. The avera

PER CENT.	WEIGHT.	HEIGHT.										LENGTH.				GIRT									
		Height.	Sternum.	Navel.	Pubes.	Knee.	Sitting.	Right Shoulder Elbow	Left Shoulder Elbow	Right Elbow Tip.	Left Elbow Tip.	Right Foot.	Left Foot.	Stretch of Arms.	Horizontal Length.	Head.	Neck.	Chest repose.	Chest full.	Belly.	Hips.	Right Thigh.	Left Thigh.	Right Knee.	Left Knee.	Right Calf.	Left Calf.
5	51.0	1625	1319	952	795	432	853	345	343	428	427	242	241	1670	1637	545	324	805	843	664	829	463	459	329	330	314	313
10	53.4	1647	1339	970	812	442	866	351	351	436	434	246	245	1696	1659	550	330	823	861	675	842	474	470	335	336	320	320
20	55.9	1674	1363	992	829	453	879	359	357	445	444	251	251	1725	1687	556	338	844	884	690	859	487	482	342	344	329	329
30	57.8	1692	1380	1007	842	461	883	364	363	451	449	254	254	1749	1709	560	342	859	900	704	872	496	492	349	349	336	335
40	59.9	1710	1399	1019	854	469	897	369	367	456	454	257	257	1769	1723	564	348	870	913	718	882	505	500	353	354	341	340
50	61.6	1724	1410	1029	864	476	905	373	371	461	459	260	260	1789	1739	569	351	885	925	730	893	514	510	359	359	347	345
60	63.5	1739	1422	1040	874	483	913	377	375	466	465	263	263	1808	1750	571	257	897	940	740	904	522	519	362	363	352	351
70	65.4	1756	1439	1057	886	490	921	282	380	472	471	266	266	1829	1789	577	360	910	954	752	915	531	529	368	369	359	356
80	67.9	1776	1454	1070	899	499	930	388	387	478	476	270	270	1850	1789	581	369	925	970	769	929	542	539	373	372	364	362
90	71.2	1804	1480	1093	919	512	943	397	395	486	485	275	275	1886	1820	588	377	949	992	794	948	559	556	380	380	374	371
95	74.3	1827	1500	1109	936	523	954	403	402	494	492	279	279	1910	1841	593	384	969	1010	814	962	579	569	388	388	381	380

OMETRIC TABLE

THE PERCENTILE METHOD

n 1884 and 1891. Arranged according to the percentage as indicated at the left.
average age of the individuals observed is 20 years and 4 months.

GIRTH.												
Right Calf.	Left Calf.	Right Instep.	Left Instep.	Upper Right Arm Contr'd.	Upper Right Arm.	Upper Left Arm.	Right Elbow.	Left Elbow.	Right Forearm.	Left Forearm.	Right Wrist.	Left Wrist.
314	313	224	224	258	227	221	229	224	239	230	153	151
320	320	229	228	265	234	229	233	229	243	237	156	154
329	329	232	232	275	242	237	239	234	250	242	159	158
336	335	237	236	283	249	241	244	239	255	249	161	160
341	340	240	239	289	253	245	249	242	259	252	163	162
347	345	242	241	295	259	252	250	247	262	256	165	163
352	351	246	245	300	265	259	255	250	267	260	168	165
359	356	250	249	308	270	264	259	254	270	264	169	168
364	362	255	253	315	277	270	262	259	275	269	171	170
374	371	260	260	327	288	280	269	264	281	275	175	174
381	380	267	265	335	292	288	274	270	289	280	179	177

BREADTH.						
Head.	Neck.	Shoulders.	Waist.	Hips.	Nipples.
145	99	393	230	301	173
147	101	402	235	306	178
149	103	413	240	313	184
150	105	421	245	317	189
152	107	427	249	321	192
153	108	433	253	325	196
154	110	439	257	329	200
156	111	445	261	333	204
158	113	451	266	338	208
161	116	461	274	345	217
163	119	468	281	352	222

STRENGTH.								
Lungs.	Back.	Chest Dip.	Chest Pull Up.	Legs.	Right Forearm.	Left Forearm.	Total.	CAPACITY OF LUNGS.
0.7	99	0	3	112	28	26	309	2.93
0.8	104	1	4	124	30	29	339	3.16
1.0	117	2	6	139	33	31	374	3.38
1.1	124	3	7	149	35	33	406	3.57
1.2	130	4	8	157	37	35	431	3.71
1.4	139	6	9	169	39	37	453	3.89
1.5	149	7	10	175	41	39	479	4.03
1.6	150	8	11	184	43	41	507	4.22
1.7	160	10	12	199	46	43	542	4.42
2.0	178	12	14	219	50	47	594	4.69
2.2	194	14	16	238	53	50	644	4.95

able that we could get a true binomial curve from these heights, since we might easily find that the shortest or the highest chairs were the most numerous (or were more numerous than those of any other height). The percentile scheme implies that there is always a central standard. If we could measure all the bricks in the country we should find the great majority of them were a certain size than which there are few smaller, the variations being almost entirely towards the larger sizes. We could very easily arrange their dimensions in a percentile chart, but if we constructed a curve with them we should find that instead of being symmetrical the class of smallest bricks would have in it the greatest number, and from there it would slope down, by various jerks, to the largest brick that was made. I once arranged a percentile table of the age of members of a certain Young Men's Christian Association. The age limit was 17. I was able, however, to grade them off very nicely, bringing the 50 per cent up to about 22. I then constructed a curve, but found that there were more individuals at 17 than at any other point, 18 coming next, 19 next, and all forming a regularly descending line, though not a binomial curve. Thus, this objection is simply that we must construct the curve for each item, or in some way establish that it is a true binomial curve before we have any right to make it conform to the percentile scheme. This is the first difficulty.

Second, it is assumed that the various items are so related that taking any given percentile grade in each we shall have a set of numerical values that will represent the symmetrical man. Thus because five per cent of men have a weight of 51 kilos, and five per cent of men have a height of 1.625 M., and five per cent of men can lift but 112 kilos, therefore the individual man who is 1.625 in height ought to weigh 51 kilos, and should be able to lift but 112 kilos. This can perhaps be answered by an examination of a percentile table, which is included on an accompanying sheet.

It is only fair to Dr. Hitchcock to say that he apparently has fallen into the error that is under discussion, for the claim that it is a "standard of symmetry" is not made for it. This particular table is used in preference to those from elsewhere, inasmuch as the *same* measurements from which it was constructed have also been treated in other ways, and thus form an unusual opportunity for the comparison of methods.

At the extreme left is the column indicating the per cents. Thus we notice under five per cent weight 51 kilos, and height 1.625 M. This means that five per cent of the total number examined fell below 51 kilos in weight, and below 1.625 M. in height. Looking along further in the same column we find under chest dip 0, and under chest pull up 3. Thus five per cent of men cannot dip at all, and can pull up 3 times or less. There is no question that each of these items gives us a definite and useful fact. It is now assumed by some that because a given man weighs 51 kilos that therefore he ought to be but 1.625 M. in height, pull himself up but three times, and not dip at all. In other words, that these figures in any given column of per cents represents the symmetrical standard. In Table II, column B, we find the measurements of all men who are from 1.620–1.630 in height averaged. Note that they can dip 8.8 times, and pull up 10.6. Turn again to the percentile and note that the man 1.827 M. in height can or should, if the assumption is true, dip 14 and pull up 16 times. Turning again to Table II, note column C, which gives the average measurements of the man between 1.820 and 1.830 in height. The man of this height can dip but 5.6 and pull up 8.1 times. Thus we secure two sets of results. The man 1.625 in height pulls up either 3 or 10.6 times, and the man 1.825 in height pulls up either 16 or 8.1 times, according to the method employed in tabulation.

It will doubtless be objected that only items that are more closely related than are height and strength should be tabulated into percentile classes and be expected to produce

TABLE II.

		A.	B.	C.
	Weight	61.2 Kilos.	54.1	68.3
	Stature	M. M. 1,725	1,620	1,820
Heights.	Sternum	1,410	1,300	1,480
	Navel	1,030	962	1,090
	Pubes	860	810	919
	Sitting	903	869	939
	Knee	476	439	519
Lengths.	R. Sh. Elbow	373	351	395
	L. Sh. Elbow	371		
	R. Elbow Tip	461	436	486
	L. Elbow Tip	459		
	Right Foot	260	244	274
	Left Foot	259		
	Stretch of Arms	1,780	1,690	1,890
	Horiz. Length	1,732	1,640	1,820
Girths.	Head	572	562	583
	Neck	349	340	356
	Chest, repose	880	854	898
	Chest, full	927	888	953
	Belly	724	703	748
	Hips	893	864	922
	Right Thigh	517	500	525
	Left Thigh	512		
	Right Knee	361	341	368
	Left Knee	359		
	Right Calf	359	332	355
	Left Calf	349		
	Right Instep	245	231	246
	Left Instep	242		
	R. U. Arm	257	246	261
	L. U. Arm	253		
	R. U. A., cont	295	280	300
	Right Elbow	251	240	254
	Left Elbow	247		
	Right Forearm	267	250	266
	Left Forearm	261		
	Right Wrist	166	161	170
	Left Wrist	165		
Breadths.	Head	155	151	156
	Neck	108	106	109
	Shoulders	430	418	440
	Nipples	198	192	206
	Waist	250	245	263
	Hips	323	315	341
Strengths.		Kilos.		
	Lungs	1.5	1.4	1.1
	Back	137	126	147
	Legs	166	147	174
	R. Forearm	41.5	33	42
	Left Forearm	38.1		
		No. of times.		
	Dip	6	8.8	5.6
	Pull Up	9	10.6	8.1
	Lung Capacity	Litres. 3.77	3.25	4.43
	Pilosity	Tenths of Body. 2.25	2.4	2.06

straight lines with symmetrical individuals. To answer this I refer you back to Table I.

I have taken Dr. Hitchcock's averages for the men, 1.62 and 1.82 M. tall, found in Table II, Columns B, C, and plotted them on this percentile chart (Table I). You notice that they do not correspond at all in certain particulars; in other particulars they correspond very well. I have rearranged the items on the chart to a slight extent, so that all the bone lengths come together; otherwise the chart is in its original condition. It is first to be noted that the line of the man 1.620 M. in height pursues a course in the main between five and ten per cent as far as Horizontal Length. Here it takes a sudden drop and does not again reach the ten per cent line. Notice, similarly, that the man 1.820 M. in height (the lower line) makes a line similar in its general outline to the shorter man, but reversed from it. From this it is easy to deduce that the bone lengths vary with the height, but that the girths do not. Tall men have smaller muscles in proportion, and short men larger muscles in proportion, than would be indicated if the percentile line was accepted as the standard of symmetry. This assumption can be shown in a humorous way by the following illustration: Because ten per cent of men wear full beards, and ten per cent also weigh 157 pounds or over, it does not follow that the man who wears a full beard should weigh 157 pounds or over. The relationship between these two items must be established before any such deduction could be made.

Third. Another difficulty with this use of the percentile method for the objects stated is that it assumes that there are no different types, that there is but one standard of symmetry. This would be like the assumption that there is but one standard for all different nationalities. If we could measure all the individuals in the world, or at least a large proportion of them, we should no doubt get some interesting statistics, but to measure an indefinite number of African pygmies and Europeans and construct a percentile table from

them would be on its face absurd. We have different types of men, shown by the various forms of old Greek statues, any of whom may be said to be symmetrical. The same may be said of our modern athletes.

More important, perhaps, than this is that there seems to be a difference in the proportions of tall men and short men, that is, growth in girth of bone and muscle does not seem to correspond with growth in length of bone, so that as a matter of fact instead of finding that tall men are simply big little men we find that they have other standards, and are not similar in proportion to short men. Any scheme of statistical study which ignores this, or which renders its proof impossible, is useless for the purpose mentioned at the opening of this paper.

There is, however, another view that should be taken. The mean and the percentile scheme properly used show us what we are. These values have a wonderful stability and certainty. But we are told by some that this mean also tells us what *we ought individually to be*, giving us the ideal (not merely the type) of the race, the goal that is before us, and toward which we should all press.

If we lived under ideal conditions, then it would be true that the mean would represent the central standard; but we are not under ideal conditions, and securing the mean from us, as we are now, and affirming that it is the standard to which we should conform, would be like taking the mean of ten thousand cases of dyspepsia and saying that all should conform to the mean of these. It would be like taking the measures of the waists of ten thousand college girls, who notoriously do more mental and less physical work than they should, a great majority of whom have more or less constriction at the waist, and saying that this represents the standard around which the world revolves. It represents, and will continue to represent, the actual condition of things, and will not change from century to century *until the conditions change*. Only by different conditions can we get a different mean.

It is the business of all reformers to spur people on, not towards a mean, not towards a central standard of what people already are, but towards an ideal. If it were true that the moral sense of as many people is too acute as it is true that the moral sense of the people is too blunt then the mean would represent the ideal, but who would wish to say that the mean of the moral sense of the people (if he had a method of ascertaining it) would represent the ideal toward which we should struggle?

It follows, then, that no matter how accurate the mean, nor how desirable the percentile, scheme for the giving of light on certain difficult aspects of anthropology, it is of doubtful value, when used as indicated, for the securing of an ideal standard which shall be of practical value in directing physical exercise.

I believe that it is incumbent upon those who criticise to suggest something better. I would suggest, then, that methods of anthropometric statistical study should be adopted which take nothing for granted, and which will allow any peculiarities or unexpected laws in physical growth, etc. to show themselves.

I am at present working upon the following, for which, however, no special originality is claimed: I endeavor to secure, from as many gymnasia in the country as will co-operate with me, the measurements of those individuals who have lived, as far as may be ascertained, under approximately ideal conditions of work, and rest, and food for a term of years. These I propose to tabulate, forming a table which will appear somewhat like the percentile, but in which the mean of the individuals of each group in height will be taken, all tabulated together in the construction of the central class alone. Thus, if there are differences in structure they will show themselves. If there are not they will not. I shall not expect by this to get an ideal standard. I do expect, however, to get a standard which will be very much nearer the ideal than we could get by tabulating the measurements

of a great number of individuals, nearly all of whom are confessedly below par in most respects.

In the brief discussion of the above paper it was evident that the impression was given that a general criticism of the percentile system was intended. I had no such thought in mind, for I recognize that in this method we have a way at arriving at many facts that are otherwise beyond us. What I did intend to criticise was, 1st, the assumption that the measurements of an individual should fall in a straight line on one of these charts; and, 2nd, that this should be taken to be the standard of perfection in form.

REVIEWS AND NOTICES.

MORTALITY EXPERIENCE.

Mortality Experience of the Australian Mutual Provident Society. 1849–88. Compiled by Richard Teece, F.I.A., Actuary and Manager.

This is a very complete and exhaustive analysis of the mortality experience of the largest Australian company, covering an aggregate of 114,471 lives. These statistics are of unusual interest to actuaries, owing to the fact that this company has been under an actuary as chief ranking officer and actual manager. The business man who is so prominent in American companies, and often so contemptuous about mere theorists, is relegated to the background. This actuary manager has dared to follow his nose, too, without troubling too much about the difference between theory and practice. The consequence is that the statistics under consideration deal with a variety of subjects not so common in compilations of this sort, because of the want of data.

Among these subjects are: the effect of an absolutely free surrender system on selection; the effect of classification of risks upon the mortality; the effect of initial selection, as shown by comparing the mortality for the first five years of insurance with the mortality of later years; the mortality of annuitants; the effect of maternity upon the mortality of females; the result of conscious selection of endowment insurance upon the mortality; the influence of occupation and nationality on the mortality; the mortality according to amounts at risk in comparison to lives; the rate of discontinuance as affected by the liberal surrender privileges; the mortality from various diseases.

The mortality of the company is low, though not lower than some American companies, which have not published their experience, claim to be experiencing. It is, however, lower than any experience which has been submitted to the scientific world, being an average of but 67½ per cent of the mortality according to the H^m table. The experiment of insuring diseased lives, by adding to the actual age,

has been fairly successful, resulting in a mortality but very little in excess of the average. An exhibition of the principles upon which the company discriminated would be very instructive, and it is to be hoped that to this the medical officers will next turn their attention. The number of lives in this class is large, comprising fully one-third of the whole. The result of the conscious selection of endowment insurance by the best lives is found to be a diminished mortality. This is harmonious with the received ideas on that subject, and if by endowment insurance is meant any insurance which puts a premium on living, there would seem to be good sense in support of the statistics. Precisely contrary to received ideas is the effect of an absolutely free surrender system, coupled with most absolute non-forfeiture provisions; it is found that the effect is rather beneficial than otherwise, no adverse selection taking place. It is likewise found that a less surrender and lapse rate is experienced than in companies which discourage discontinuance under pain of forfeiture. This anomaly is perhaps explained by the fact that a man is permitted to borrow on favorable terms nearly as much as he can obtain upon surrender. As I have elsewhere pointed out, there is also good reason to believe that actuaries are counting too much on the reason of mankind in assuming that men will on the average act for their own interest; there is every reason to believe that the obstinacy of the average individual impels him to rebel against restraints which he considers unjust, and to be the more obstinate about it. The results of this investigation appear to confirm that view.

The mortality of women because of maternity was not found to be in excess of the greater mortality from other causes among males. The principal thing which stands in the way of the free insurance of women is the difficulty of securing a satisfactory examination, which difficulty seems likely to disappear now that so many women are entering the medical profession. The mortality from various diseases shows, as might be expected, a considerable variation from the American and English experiences. There is a lower percentage from consumption, a higher from intemperance and from violent deaths, which latter the medical officer ascribes to the newness of the country. The mortality among annuitants is found to be considerably lighter than among insurers, which agrees with all previous statistics. There seems to be good reason to conclude that native Australians are better lives than immigrants from other countries.

All in all, the compilation is very scholarly and instructive, and is a distinct advance in the matter of life insurance statistics. It also seems to prove conclusively the superiority of "theorists'" management.

MILES MENANDER DAWSON.

BULLETINS OF THE CANADIAN CENSUS.

No. 1. August, 1881. *Preliminary Returns of Population.*

No. 2. October, 1891. *Population of the Sub-Districts of the Province of Ontario.*

Twenty-nine counties show an increase and twenty-one a decrease in population. The decreases are attributed (1) to the difference in the mode of counting the people. Severe rules were adopted to prevent duplications. A time limit in taking the census was adopted. There was far less duplication. (2) To the movement of population westward to the virgin soil, and from the country to the city. (3) To the introduction of agricultural machinery, which has done away to a certain extent with hired help. (4) To the denudation of the forests, which has driven out the lumbermen and mill hands. (5) To the opening up of 6000 miles of railway. (6) To the development of mining industries in Algonea and Nipissing, which has driven a considerable number from Ontario.

No. 3. November, 1891. *Population of the Eastern Maritime Provinces.*

The increase in these provinces was very slight between 1881 and 1891. The family is becoming smaller, due to the decrease of early marriages and increasing tendency to celibacy. This accounts, in a measure, for the small increase in population, for while the population increased 1.2 per cent the number of families increased 4.1 per cent.

No. 4. December, 1891. *Population of the Province of Quebec.*

The population increased 9.5 per cent and number of families 7 per cent.

No. 5. February, 1892. *Population of Manitoba, Northwest Territories, and British Columbia.*

It took an enumerator 164 days to enumerate the people who lived in one of the districts of British Columbia, and the total number of persons recorded in this district was 2420, an average of about 15 a day.

No. 6. February, 1892. *Dwelling Places of the People of Canada.*

There are 930,684 dwellings. Of these 250 were built of sod, and there were 10,555 shanties. Of the 919,879 houses 54,164 were empty and 10,873 under construction. There is a greater increase in dwelling places than in population, which indicates that the population is better housed. Of the 854,842 inhabited houses 131,522, or 15.3 per cent, were of brick, and 25,964, or 3.1 per cent, were of stone. Of all the inhabited dwelling houses 39 per cent are one-story buildings.

No. 7. March, 1892. *Live Stock in the Northwest Territories.*

No. 8. April, 1892. *Manufactures.*

Relates to the number of industrial establishments, value of machinery and tools, the number of employes, and number of steam engines. The proportion of men, women, boys, and girls in every 100 wage-earners employed in factories and workshops is as follows:

	1881.	1891.
Men, ...	76.07	73.67
Women, ...	16.29	19.12
Boys, ...	5.56	5.28
Girls, ...	2.08	1.93
	100.00	100.00

No. 9. May, 1892. *Religions.*

The Methodists have made the greatest proportionate increase in the Dominion, as a whole. They are followed by the Presbyterians, Church of England, and the Catholics. The Roman Catholics constitute 43.17 per cent of the population and the Methodists 17.90 per cent.

No. 10. June, 1892. *Manufactures.*

It is estimated that each workman produced in 1891 $1292.44, and received in wages $271.20, or 21 per cent. It is reasoned that capital is receiving a proportionately less share in the product than in 1881.

No. 11. June, 1892. *Birthplaces of the People.*

The following table shows the component parts of the population of the Dominion on the basis of 10,000: —

	1881.	1891.
Native born,	8,580	8,650
Born in England,	390	460
" " Scotland,	270	230
" " Ireland,	430	310
" " Newfoundland,	10	20
" " other British Possessions,	6	10
" " European countries,	91	110
" " United States,	181	170
" " other countries,	42	40
	10,000	10,000

No. 12. July, 1892. *Manufactures in Cities, Towns, and Villages.*

No. 13. August, 1892. *Wages.*

Returns are made for the first time as to whether manufacturing establishments run full or half time. In the year ended April, 1891, 64.3 per cent worked full time.

No. 14. September, 1892. *Mortality.*

Evidence is introduced to show that the returns of deaths are fairly accurate. According to the returns the death rate in 1890–91 was 14.10 per 1000. In the Province of Quebec and in Ontario the death rate of the French Canadians is much higher than that of the rest of the community. Mortality tables according to age periods are also given. Over two-fifths of the deaths were of persons who had not reached the fifth year. The birth rate is estimated at 28.3 per 1000. In the Province of Quebec it was the highest, 36.86.

No. 15. January, 1893. *Mortality.*

This supplements Bulletin 14 in giving the causes of death. The classification of the Registrar-General of England is adopted.

REPORTS OF LABOR STATISTICS.

Third Biennial Report of the Bureau of Labor Statistics of Minnesota, 1891–92. L. G. Powers, Commissioner. Minneapolis, 1893. Pp. 446.

This report is composed of four parts, as follows: 1. Factory Inspection; 2. Inventions in Flour-Making Machinery, and the Prices of Wheat, Flour, etc.; 3. Trade Unions; 4. Mortgage Foreclosures and Redemptions and Land Values in Minnesota in the Years 1881 and 1891.

Much of the material is of a descriptive and historical character rather than statistical. This of course in no way detracts from its value, for the material is much better presented than is frequently the case in similar reports. An effort is made to collect statistics of accidents in factories, but the Board finds great reluctance on the part of employers to make true returns.

The question of factory accidents has led the Bureau to inquire into the workings of the German Accident Insurance Act, and tables are reprinted from the *Statistisches Jahrbuch* for 1892, presenting the results for the year 1890.

The chapter on Trade Unions describes at length the history of twenty of the principal workmen's organizations in the United States.

Tenth Annual Report of the Bureau of Labor of Michigan, Feb. 1, 1893. Henry A. Robinson, Commissioner. Lansing, 1893. Pp. 1353.

This bulky volume is made up of various compilations, somewhat heterogeneous in character. Section III, for example, "treats of sociology, giving some explanations of the tenents thereof." Part II contains an investigation of the building trades; Part III contains the investigation of mortgage indebtedness; Part IV relates to royalties on the unearned investments of mines and timber; Part V treats of pauperism and the defective classes; and other portions deal with the cost of living, farm mortgages, and strikes. The Michigan Report is in need of more careful editing.

Fifth Biennial Report of the Commissioner of Labor, Census, and Industrial Statistics. Wisconsin, 1891–92. Madison, 1892. Pp. 175.

About one-half of this report is devoted to statistics of the building trades and of manufactures. The other portion is a record of factory inspection. Statistics are largely confined to wages and hours of labor.

Fifth Annual Report of the Commissioner of Industrial Statistics of Rhode Island. Providence, 1892. Pp. 191.

This issue is devoted exclusively to children and child labor. It is found that the employment of children is not so great as formerly, although the population has increased. The total number of children employed is 5273, of which 2977 are boys and 2296 are girls. By age these are classed as follows: —

10 years of age,	264
11 " " "	381
12 " " "	935
13 " " "	1,134
14 " " "	2,339

55 per cent of the children are native born, and 45 per cent foreign born. 80 per cent have foreign born parents. The greatest number of children are employed in the cotton and woollen industries. Statistics of wages are also added.

Seventh Annual Report of the Bureau of Labor Statistics of Connecticut for the Year Ending Nov. 30, 1891. Hartford. 2 vols. Pp. 1510.

Mr. Samuel M. Hotchkiss, recently Commissioner of Labor Statistics in Connecticut, undertook a most laborious but useful task in devoting the energies of his office to an inquiry of the fraternal mutual benefit societies in operation in his commonwealth. He accordingly brings together the results of his investigations relating to the fraternal mutual benefits societies of all kinds; life, sick, and funeral benefit; trades unions with sick and funeral benefits; and endowment societies. The inquiry covers five years, and the results are full of interest.

There are in Connecticut 386 fraternal mutual benefit societies of all kinds, with 974 branches or lodges. The membership at the close of the year 1891 was 126,613, of which about 8000 were women. 116 of the societies insure lives. In 1891 all the societies received from their members $1,411,458, and expenditures were $1,159,515, divided as follows: —

Sick and funeral benefits,	$319,190
Death payments,	465,245
Expense of management,	296,722

A summary of these statistics is presented in the following table: —

NUMBER AND PERCENTAGE INCREASE OF MEMBERS. ALL SOCIETIES BY GROUPS AND YEARS.

Years.	All Societies.			Life.			Sick and Funeral Benefit.		
	Members.	Increase.	Percentage of Increase.	Members.	Increase.	Percentage of Increase.	Members.	Increase.	Percentage of Increase.
1887	74,554	.....	.....	20,848	.....	.....	46,092	.....	.....
1888	85,739	11,185	15.00	24,597	3,749	17.98	52,950	6,858	14.87
1889	95,829	10,090	11.77	27,839	3,342	13.18	58,643	5,693	10.75
1890	111,587	15,758	16.44	30,729	2,890	10.38	69,232	10,589	18.05
1891	126,613	15,026	13.47	32,898	2,169	7.05	79,921	10,689	15.43

(*Table continued.*)

Years.	Trade Unions.			Endowment.		
	Members.	Increase.	Percentage of Increase.	Members.	Increase.	Percentage of Increase.
1887	7,614	....	....	.....	.....	.....
1888	8,124	510	6.69	68	68	100.00
1889	8,492	368	4.52	855	787	1,157.35
1890	9,239	747	8.79	2,387	1,532	179.18
1891	10,042	803	8.69	3,752	1,365	57.18

The statistics are well digested, and the whole work is worthy of study and reference.

NOTE ON LABOR BUREAUS.

Some time since an account was given in these *Publications* of the establishment in France of a Bureau of Labor. The information has recently been received of the foundation of a Labor Bureau in Great Britain with the well-known statistician, Mr. Robert Giffen, at its head. It is gratifying to note the influence of our own Department of Labor in this connection. Dr. E. R. L. Gould having contributed a decided impetus to the movement towards the creation of the Bureau. In December, 1892, he appeared before the Labor Commission, now sitting, and gave a lengthy and exhaustive testimony in regard to the labor bureaus in the United States. Being plied with innumerable questions, he has given a very interesting and very accurate account of the Department of Labor, which contains perhaps the best statement which has been made of its work and methods. As Dr. Gould had been several years in Europe, it does not detract from the value of his testimony to note a slight inaccuracy in regard to an event of recent date. Dr. Gould was incorrectly informed in representing that the Department of Labor was unwilling to take up the work recently assumed under the direction of the Finance Committee of the Senate, and disowned responsibility for the results (No. 6512). The Commissioner, on the contrary, was glad of the opportunity of doing this statistical work despite the burden upon his office which it involved. He limited his work and his responsibility, however, to the collection of the facts, leaving to the committee the labor and responsibility of the analysis of them.

Of equal interest with the account of labor bureaus in the United States is Dr. Gould's testimony in regard to the progress of statistical work along social lines in Europe. Here we let him speak for himself. In reply to a question (6748) of Prof. Marshall, as to the spread of the movement in this direction, he said: "Unquestionably, the movement for the development of labor statistics is taking a very wide extension everywhere. I remember at the Congress, which was held in Vienna last year, the Congress of the International Institute of Statistics, the bulk of the more distinguished statisticians enrolled themselves as members of the committee on labor statistics. That was the first indication. The second thing which resulted from the Congress was a resolution from this committee urging upon the attention of different Governments the importance of organizing statistical agencies to deal, in a greater measure than hitherto, with labor and social questions, with the expressed conviction of opinion that that was the most satisfactory way in which we could approach the study of the subject. Since that time there have been called into existence commissions in Austria and in Germany to study the question, in order to find out in what direction they can best enlarge the study of labor and social statistics. I had a talk the other day in Berlin with Dr. Geheimerath Von Scheel, who is the director of the Imperial Statistical Bureau, Berlin, in which he said that they were now discussing the question, and that it was only a matter of a short time when they should have, if not a distinct bureau of labor statistics, at all events, a development on one side of his department which should consecrate itself solely to that work. I had a letter a short time ago from Dr. Inama-Sternegg, who is the president of the Imperial Statistical Commission in Vienna, asking me for information in relation to the latest development of American labor statistics, saying that they were determined to extend the Central Statistical Commission in Vienna, by adding to it a section which should give itself to the study of labor statistics. Shortly before that I was in Norway, and in conversation with Dr. Kiaer, who is the chief of the Royal Statistical Bureau of Norway, he told me that he was, on his own responsibility, without an increased appropriation, giving himself now to the collection of labor and industrial statistics. The other day in Brussels, I had an exceedingly interesting conversation with M. Beernaert, the Prime Minister of Belgium, and M. Leo de Bruyn, the Minister of Agriculture, Commerce, and Industry, and both of them told me that

they were organizing a distinct labor bureau, on the model, as far as they could make it applicable to their country, of the Department of Labor of the United States. Still a little further back I had the pleasure of assisting at the organization of the French *Office du Travail*, and giving information before the superior council in somewhat similar fashion to what I am now giving you today. These things, I think, are plainly indicative of the fact that nations are becoming alive to the point which I have just been endeavoring to make, not to the experimental or possible benefit, but to the certain benefit, judging from the past utility of these organs of original social inquiry."

REPORTS OF CHARITIES AND CORRECTIONS.

Fifth Biennial Report of the State Board of Corrections and Charities of Minnesota for the Year Ending July 31, 1892. Minneapolis, 1893. Pp. 256.

Reference has been made in previous issues of the *Publications* to the admirable system followed in tabulating the statistics of charities and corrections in Minnesota under the direction of its secretary, Rev. H. H. Hart. The classifications are clear and easily understood. A summary presents the number of public charges in each million of the population.

	In the United States.	In the North Central States.	In Minnesota.
In state prisons	722	491	332
In county jails	312	189	160
In juvenile reformatories	328	250	218
In almshouses	1,166	1,145	280
Insane persons	1,698	1,649	1,693
Dependent children	.....	.....	424
In soldiers' homes, etc	.....	.....	.....
Of each 10,000 veterans	287	298	179

This is a most favorable showing for Minnesota, and would indicate that her immigrants have been of a higher standard than in other portions of the country. The ratio of paupers to each million of inhabitants was in June 3942, and in December, 5274. In some of the counties the ratio is more than twice as large. The average cost

per inhabitant for support of paupers is 23.7 cents. A strong plea is advanced in favor of a registration of paupers and criminals, a system carried out only in Massachusetts.

Twelfth Biennial Report of the Board of State Commissioners of Public Charities of Illinois. Springfield, 1893. Pp. 326.

As Mr. Wines, the secretary of the Illinois Board of Public Charities, has charge of the pauper and criminal statistics of the Eleventh Census, it is natural that special attention should be given in the state report to the statistical aspects of crime and misfortune. This is done in Chapter IV. It is concluded that the aggregate burden of the insane, idiots, deaf and dumb, blind, paupers, and prisoners is much greater than it was forty years ago. The actual numbers in the United States of each class reduced to ratios per million of the whole population give the following table:—

RATIOS.

Classes.	1890.	1880.	1870.	1860.	1850.
Insane	1,697	1,833	971	765	673
Idiots	1,526	1,533	636	602	881
Deaf and dumb	659	675	420	408	423
Blind	805	976	527	403	422
Paupers	1,166	1,320	1,990	2,638	2,171
Prisoners	1,315	1,169	853	607	290

"According to the foregoing statement there has been a surprising relative increase in the number of insane, idiots, deaf and dumb, and blind during the past twenty years. But this apparent increase is not real. It is due to the improved methods of enumeration of these special classes, introduced in the canvas of 1880 by Mr. Wines, with whom they originated, and they have been substantially followed by Dr. John S. Billings in 1890. The same remark applies to the enumeration of the paupers and prisoners; the relative number of paupers appears to have rapidly declined, and that of prisoners to have increased. But the figures are very misleading, and have given rise to many erroneous inferences.

"With regard to the so-called 'defective' classes it should be known that Mr. Wines, in 1880, supplemented the enumerators' returns by correspondence with physicians, who added many names to the lists. This correspondence was not renewed in 1890, which accounts, at least in a large degree, for the seeming slight falling off

in the ratios in 1890, especially of the insane. It must further be said that Dr. Billings, for the first time in the history of the census, has attempted to enumerate all the deaf, including those deaf in one ear, or merely hard of hearing, and not included in the special class technically described as 'deaf mutes,' or the 'deaf and dumb.' He has also attempted to enumerate all the blind, including those blind in one eye, but able to see with the other. In the tables here given the blind in one eye and the deaf only, who are not deaf-mutes, are not included. But evidently the change in the method of enumeration may account for a part of the difference in ratio is between the census of 1880 and that of 1890.

"The census of paupers in 1880 and 1890 was confined to paupers in almshouses, and the figures showing the number 'outdoor' paupers returned are not included in the tables. Prior to 1880 it is obvious from inspection that the distinction was not made, and that the figures for previous years are based on no exact definition of the word 'pauper.' Hence, they are practically of no value whatever.

"Neither the paupers nor the prisoners were counted, before 1880, on any proper system, almshouse by almshouse, and prison by prison. It is well known that the figures are a guess, and a very bad guess at that. The figures of 1880 and 1890 are worthy of confidence."

Eleventh Biennial Report of the Michigan State Board of Corrections and Charities, 1891–92. Lansing, 1893. Pp. 169.

There are few general and comparative tables in this report. The aggregate daily average of inmates during the last year in penal institutions was 1179, an increase of only 15 as compared with five years ago. On the other hand, the Detroit House of Correction has an increase in monthly average of over 294. The total number of insane in state charitable institutions in 1892 was 3468, as compared with 2576 in 1887.

THE CIVIL SERVICE OF BUENOS AYRES.

Estudio Estadístico del Presupuesto Nacional seguido de un Proyecto de Reforma del Mismo, etc. By Francisco Latzina. 1893. Pp. 75. Tables.

In the introduction to this work the author states that since the establishment of the Republic the statutory law has become, little by little,

in the course of many years, a museum of incongruities. There does not exist any systematic method of specifying by names the different grades among the civil employes, or of giving equal salaries to officials nominally in the same class. In some cases, for example, in a single department, employes of the third class earn more than those of the first class.

This inquiry is intended to initiate a reform in the civil service, especially in this respect. As it is necessary to make an exposition of the actual state of affairs as a preliminary to proposing reform, there are given two tables showing, first, the different salaries in order of amount, and the various positions which receive the same salary; second, the various grades and classes of offices, and the inconsistent arrangement of salaries that exists. After this a series of tables sets forth the plan of reform proposed, with a systematic classification of offices in the different departments, and a logical method of determining compensations. There is also given a table of the estimate of expenses for 1892. This goes to some length, and to many of the more minute details, but does not attempt to give the resulting totals.

After these tables are the proposed laws regarding the civil service. Under four heads these provide for the reforms already mentioned; they also state qualifications necessary for public servants, as to examinations, *et cetera*, and provide for pensions for the superannuated and for the widows and children of public employes.

The relative importance of certain positions as considered in this South American state, shown by their respective salaries, is noteworthy. For instance, the salary of an accountant ranges from $60 to $600; that of a teacher or professor, from $31 to $200. The amounts of almost all the salaries are ridiculously small; for the cost of living is not very much less than here in the United States, and consequently the actual value of the nominal salary is not so great as here. Salaries often go unpaid for long periods,— just before revolutions, for instance. It may be true that the higher officials have "perquisites" to reinforce their salaries, but how can telegraph operators maintain themselves on from $50 to $100 a year? A gentleman, Mr. Johann Meyer, who has visited Buenos Ayres, says that even the humblest employes dress magnificently, and are very proud of their "governmental" office. Their relatives perhaps help support them for the social prestige the connection brings, and the official satisfies himself as to the rest with the honor.

The study as a whole is of decided interest, and shows a painstaking, complete, and minute investigation on the part of the author and compiler.

L. P. Lane.

ASSISTED EMIGRATION.

Del Patronato degli Emigranti in Italia e all' Estero. By Dr. Egisto Rossi. Relazione al Primo Congresso Geographico Italiano, Genoa, 1892. Rome, 1893. Pp. 93.

This paper gives a history of the development of the societies which have sprung up in every new country on the globe, to assist ignorant emigrants to start in life under the changed conditions. In the United States the Germans have been foremost in this direction, and have done a good work for their countrymen in many ways. Nearly all the European colonies in New York have organized in some way to protect and encourage those who come to the United States. They have built hospitals, and they dispense much money in charity; they take charge of savings, and find employment for those in search of work; they give legal counsel, purchase tickets, and even acquire homesteads; in short, they do everything in their power to make it easy for the ignorant and helpless to begin life anew. And this activity, while most pronounced in the great port of entry in the United States, is manifested in every place where immigration is present.

The great defect in the organization of the Italian societies is the lack of coöperation in the home country. The English government has offered a good example in this respect, and Sig. Rossi has shown most admirably the proper way to organize in Italy in order to secure the same result. The monograph contains many interesting statistics of the work done by these various societies, and is an eloquent plea for an extension of the work in Italy. It is, however, of no particular importance for American readers, except in so far as it shows the extent to which our seaports are flooded by a horde of people who come here totally ignorant of their own interests, and often almost penniless. In proportion as the figures show the need of charity among these people, so does it become more evident that the one problem from the American standpoint is to sift out this indigent and ignorant element before it leaves the shores of Europe. And here

alone it seems is the significance of this eloquent plea for us. We have more than enough of assisted emigrants; but if societies can be organized in Europe to inform emigrants as to the new conditions, to enable the more energetic and worthy ones to come under the most favorable circumstances, and to discourage all those who threaten to become charges upon the community, then will they be deserving of the most cordial support from our people. This seems to be the end desired by the author, and deserves hearty coöperation so long as its activities are strictly limited to the dissemination of information and the encouragement of deserving emigrants from Italy.

W. Z. R.

INDEX NUMBERS.

The following statement is made by Mr. Sauerbeck, in continuation of the figures supplied in former years in a communication to the Secretary of the Institute of Bankers (London): —

3 Moorgate Street Buildings, E.C.
12th January, 1893.

SIR: —

I have much pleasure in giving you the result of my index numbers of the prices of 45 commodities (1867–77 = 100).

1873	111	1887	68
1880	88	1888	70
1883	82	1889	72
1884	76	1890	72
1885	72	1891	72
1886	69	1892	68

The index number for 1892 is 4 points lower than that for the preceding year, and is on a par with 1887, the lowest figure on record. The great trade development in 1888–89 led to an enormous increase in the production of many commodities, and the depression which commenced in 1890, aggravated by the financial difficulties, by the effects of the McKinley Tariff, deficient harvests and the fall of silver, continued all through 1891 and 1892.

The various articles comprised in the group of corn declined almost uninterruptedly during the past year until, at the end of the year, English wheat had fallen to 25*s.* 8*d.* per quarter, the lowest price known for the last 100 or 130 years. The middling and inferior sorts of beef and mutton were depressed particularly towards the end of the year, but pork ruled distinctly higher than in 1891. Sugar did not vary to any great extent, but the lower classes of tea have risen sharply since the month of August. Coffee has now been on a very high level for about 6 years, and is the only

article the index number of which is above 100. Metals remained low, and coals were also much cheaper than in the two preceding years.

Textiles, which fell heavily in 1890 and 1891, were on the average again lower. Cotton middling American, on the spot touched 3 9-16*d.* per lb. in March, futures being even cheaper, and was practically on a par with the lowest price in 1848, which was 3½*d.* It rose, however, to 5⅛*d.* when it became known that the new crop would be much smaller. The average prices of wool were exceptionally low, and jute, very high at the beginning of the year, dropped about 50 per cent, but recovered again a small part of the decline. Oils were also lower than in 1891, and petroleum at or below 4⅛*d.* has never been so cheap.

The monthly fluctuations were as follows:—

1889	Dec.	73.7	1892	June	67.7
1890	"	71.1		July	67.8
1891	"	71.4		Aug.	67.4
1892	Jan.	70.0		Sept.	66.8
	Feb.	70.0		Oct.	67.4
	Mar.	69.1		Nov.	68.2
	Apr.	68.9		Dec.	67.7
	May	68.8			

The figure for September is the lowest touched during this century, and the index number for December is 5 per cent lower than at the end of 1891, and 8 per cent lower than in December, 1889.

The average price of bar silver was 39 13-16*d.* per oz., against 45 1-16*d.* in 1891, or about 34½ per cent under the old parity of 15½ silver to 1 gold, and the lowest price was 37⅛*d.* in August.

I remain, Sir,

Yours faithfully,

A. SAUERBECK.

ON SOME RELATIONS OF HUMAN STATURE TO MUSCULAR STRENGTH.

The following circular of information has recently been issued by the Physical Education Department of Amherst College.

It seems to be a prevailing idea that the physical strength of men when ascertained by comparative tests and in bodies well proportioned to the height is greatest in those of shorter bodily stature. Of course the acts of leaping, walking, throwing a ball, and similar feats would be better exhibited by men of longest limbs, because of longer leverage of trunk, arm, and leg. But when the muscles of a man are made to contract upon his own weight alone, we have been apt to think that the man of short joints has a better mechanical advantage against gravity than has the longer-limbed fellow.

Such has certainly been the notion with the Physical Education Department at Pratt Gymnasium, Amherst College. But, in order properly to test this opinion by numerical and statistical facts, some special observations have just been made at our Anthropometric Laboratory. Following the arrangement and method accepted by the American Association for the Advancement of Physical Education, the six strength tests of back, legs, forearms, lungs, dip, and pull up have been used for this study. These were taken of the twenty tallest men and the twenty shortest men in the classes of '89, '90, '91, and '92, and they have been collated, arranged, and averaged for the best purposes of comparison.

The accompanying tables show the aggregates of the items selected in each class of the tall men and the short men, the averages of each item, and the difference between them both in numbers and in per cent.

We find as a result of the study that the average height of the tall men is 1809 m. m., or 71.3 inches, and that of the short men is 1665 m. m., or 65.5 inches. And as the average of a college student for the past 31 years has been 1725 m. m., or 67.9 inches, it shows a wider range between the average and the short students than the reverse.

We also find the per cent of difference between the tall and the short men, in the three points in which the tall men surpassed the short ones, was 14.50. And the three points where the short men surpassed the tall ones gave an average of 10.25 per cent. So that taking the whole six items of comparison together we find 4.25 per cent in favor of the tallest men.

As far, then, as this little study is concerned it seems to show that the idea that the men of short stature exceed those of tall stature in test measurements of strength is erroneous.

The Department here has taken the ground that the stature (bodily height) is the normal or proper standard for physical work. That according to a man's height we should apportion his work, prescribe for his health, predict his development, and construct the typical men, or, as Mr. Charles Roberts puts it, "the total height being the most characteristic and important measurement of the body, the arrangement of the table of heights has been made the model for all the rest." And this monograph showing that the men above the average height give a greater range of strength than those below it, and that the

strongest men are among the tallest, give great promise to the proposition that stature is an all important factor in the study of anthropometry.

TABLE OF TEST MEASUREMENTS OF BODILY STRENGTH BETWEEN TALL AND SHORT MEN IN AMHERST COLLEGE, MARCH, 1893.

TALL MEN.

		Height.	Back.	Legs.	Forearms.	Lungs.	Dip.	Pull Up.
Aggregates.	Class of '89	1800	3262	3867	897	328	152	195
	Class of '90	1816	3343	4285	935	348	168	203
	Class of '91	1814	3347	3999	834	326	115	167
	Class of '92	1805	3262	4249	906	312	156	197
Average.....		**1809**	**165**	**205**	**45**	**1.64**	**7.4**	**9.5**

SHORT MEN.

		Height.	Back.	Legs.	Forearms.	Lungs.	Dip.	Pull Up.
Aggregates.	Class of '89	1680	3017	3507	794	316	174	231
	Class of '90	1652	3030	3395	781	339	182	199
	Class of '91	1651	3080	3443	737	364	177	250
	Class of '92	1677	3190	3606	744	314	151	192
Average.....		**1665**	**154**	**174**	**38**	**1.66**	**8.5**	**10.9**
Difference in measure.....		**144**	**11**	**31**	**7**	**0.02**	**1.1**	**1.4**
Difference in per cent.....			**7.25**	**17.75**	**18.50**	**1.25**	**14.75**	**14.75**

Height in millimeters; Back, Legs, Forearms, and Lungs in kilos; and Pull and Dip in units.

STATE LEGISLATION OF 1892 RELATING TO STATISTICAL INQUIRIES.

The citations indicate the State, Number of chapter, and Date of approval.

The following entries relating to statistics are found in the very valuable *State Library Bulletin* of New York (Legislative No. 3, January, 1893), devoted to summarizing and indexing the state legislation of 1892.

STATE CENSUS. Enumeration of inhabitants. Appointment of enumerators and duties of secretary of state. N. Y., 5, 20 Ja.

Enumeration of population of towns claiming to have 5000 inhabitants, with view to being chartered as cities. County court to divide such town into four districts, and appoint two enumerators for each. Va., 595, 2 Mr.

Bureau of Statistics. Territorial librarian to be statistician. Deputies to be appointed by county courts. Utah, 46, 10 Mr.

Industrial Statistics. Duties of chief of Bureau. Md., 29, 25 F.

May require statistical reports from R. R. companies. Ia., 27, 8 Ap.

Statistics of Crops and Live Stock. To be collected by assessors, reported to county auditors, and final returns made to state auditor. La., 57, 25 Mr.

To present subjects of forestry and road making at meetings in counties. To collect statistics of agricultural, mining, and manufacturing industries, and information relating to abandoned farms, etc. Vt., 7, 22 N.

School Census. Providing method of taking. N. Y., 14, 17 F.

MORTALITY AND INSURANCE OF COLORED PERSONS.

The following summary is from *The Insurance Monitor.*

For several years bills have been introduced into the New Jersey Legislature designed to bring that state in line with New York and others which prohibit discriminations in life rates on account of color. This year, for the first time, the bill was successful in passing the legislature, and would have become a law had it not been for the activity of the Prudential in bringing the facts before the governor, which led the latter to file with his veto his reasons therefor, of which the following is a summary.

Gov. Werts, in his epistle giving his reasons for not signing the bill, says: —

The title of this bill is defective. It should be an act to provide for the regulation and incorporation of insurance companies, instead of incorporation and regulation, etc. I apprehend that the practical operations of the bill would prove disadvantageous to the colored race, that its

effect would be a denial to them of insurance in first-class companies. If there be companies, as alleged, which make no discrimination, this law is uncalled for as to others. If there be companies that do discriminate, the competition of the others will soon compel an equalization of rates, unless such discrimination be founded upon substantial grounds.

The governor files with his reasons a letter and a lengthy statement from John B. Lunger of Newark, actuary of the Prudential Company. He states that he made a special study of the mortality among colored people as compared with that of white, and from it deducts a table of figures. He has examined the mortality per 1000 persons insured in each class from 1883 to 1891, inclusive, and he finds the death rate as follows: 1883 — white, 15.30; colored, 23.41; 1884 — white, 15.27; colored, 18.75; 1885 — white, 16.04; colored, 22.47; 1886 — white, 17.90; colored, 24.44; 1887 — white, 16.59; colored, 21.68; 1888 — white, 16.60; colored, 21.43; 1889 — white, 15.14; colored, 21.49; 1890 — white, 17.11; colored, 21.40; 1891 — white, 16.07; colored, 21.44.

He further states that the colored people rarely insure in old-line companies, but seek to secure policies in the industrial companies, and the attempt to equalize the rates of insurance is principally aimed at the industrial companies. To further prove that the mortality is much greater among the colored people than white he secured vital statistics from the principal cities in the South.

His reasons for not getting vital statistics from the North is because they are not kept with a division in reference to color. The figures obtained from the South bear out the general proposition, but figures from the Northern localities would be stronger, it is said. In the South the colored people are acclimated. In the North they are living in an uncongenial clime. There is a high rate of mortality among negroes in the North from consumption and respiratory diseases.

Some of the information which Mr. Lunger secured is contained in the following tables of death rates: —

Nashville, Tenn. 1887 — white, 13.74; colored, 25.43; 1888 — white, 12.38; colored, 23.50; 1889 — white, 12.66; colored, 21.18; 1890 — white, 13.52; colored, 25.03; 1891 — white, 16.17; colored, 27.74.

Atlanta, Ga. 1887 — white, 14.82; colored, 32.13; 1888 — white, 13.13; colored, 35.27; 1889 — white, 12.73; colored, 32.72; 1890 — white, 15.71; colored, 36.28; 1891 — white, 15.25; colored, 34.48.

Memphis, Tenn. 1890 — white, 19.33; colored, 26.15; 1891 — white, 20.02; colored, 28.88.

Charleston, S. C. 1887 — white, 19.89; colored, 40.44; 1888 — white, 17.82; colored, 42.26; 1889 — white, 18.69; colored, 43.98; 1890 — white, 17.76; colored, 36.09; 1891 — white, 19.22; colored, 37.71.

In the year 1891 the vital statistics for the following cities showed this death rate: Richmond — white, 22.34; colored, 29.50; Savannah — white, 20.75; colored, 38.75; Mobile — white, 17.97; colored, 24.25; Anniston — white, 11.75; colored, 20.50; Birmingham — white, 14.85; colored, 26.34; New Orleans — white, 23.97; colored, 35.01.

Mr. Lunger observes that if insurance companies were forced to give the same rate to colored persons that it would necessarily cause a discrimination against the whites, for the increased losses would result in a general rise in rates all around. It would also affect the reciprocal plan of insurance.

"For instance," he says, "Kentucky has an industrial company, and should it open an office in New Jersey for insurance business the law would be operative as to that company in this state, and, therefore, under the reciprocal legislation of Kentucky the New Jersey law would be enforced against the companies of this state doing business in Kentucky."

At the present time the industrial companies give the colored people 66⅔ per cent of the benefit granted to the whites for the same premium, and it is believed that the business on that basis is not as profitable as their business with white people.

PHYSICAL AND MENTAL CONDITION OF CHILDREN.

Results of an Inquiry as to the Physical and Mental Condition of Fifty Thousand Children seen in One Hundred and Six Schools. By Francis Warner, M.D. London. In *Journal of the Royal Statistical Society*, March, 1893.

A few years ago the British Medical Association and the Charity Organization Society promoted an inquiry, through a joint committee,

for the purpose of collecting information concerning the conditions existing among children. Some results of this inquiry have been published by Mr. Francis Warner in the *Journal of the Royal Statistical Society*, for March, 1893, of which the following is an abstract.

The examination of the different children was made chiefly by inspection of their bodies, and indications of brain action. The signs noted were of two kinds: 1st, Points of form, proportion and size in the body and its parts, such as development of the cranium, palate, ears, mouth, etc. 2nd, Nerve signs, as shown by the balance of the head, spine, mobile features, ears, mouth, etc., together with movements of different parts of the body, such as the arms, fingers, eyes, etc. These were taken as signs of the action and condition of the nerve centers producing them. The inspection was conducted by placing the children in ranks and dismissing all who showed no deviation from the normal in the above respects. Those who were abnormal were then reviewed individually and described on a schedule form. This schedule card was divided into four primary columns. The heading of the first column was "development," "physiognomy," and under this were the sub-headings "cranium," "palate," "ear," "growth," etc. These names were ticked if the parts were found to be normal, and the abnormalities were described. The second column was headed "nerve signs" (movements, postures, etc.), with sub-headings "expression," "general balance," etc. In the third column particulars concerning physical health and nutrition were noted, and the fourth column contained the teachers' report of the working power of each child.

Such schedules were filled in for each of the 9186 children noted as presenting some deviation from the normal type. Of these 5579 were boys and 3607 were girls. The following summary shows the general result of tabulation of these children according to the above headings: —

Defects.	Boys.	Girls.	Total.	Percentage to Total Boys.	Percentage to Total Girls.	Percentage to Total.
Development defects...	3,616	2,235	5,851	13.4	9.6	11.6
Nerve defects.....	3,413	2,074	5,487	12.6	8.9	10.9
Nutrition defects.....	1,030	973	2,003	3.8	4.2	4.0
Dullness.....	2,216	1,463	3,679	8.2	6.3	7.3

The children represented in this table may be included under one, or even under all, of the headings; and, again, they may be included in at least 250 sub-classes, according to the combination of conditions present. In this table the smaller proportion of defects among girls is noteworthy. In only one class ("nutrition") is the percentage for girls greater than that for boys. The heading "development" includes the greatest number of children, and many of these cases are included also under the other several headings. The correlations of the four groups is shown by the following table: —

Defects.	Defective Development also Present. (Per Cent.)		Nerve Defects also Present. (Per Cent.)		Nutrition Defects also Present. (Per Cent.)		Dullness also Present. (Per Cent.)	
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
Development defects.	....	....	54.6	49.0	20.2	32.0	38.3	41.5
Nerve defects.....	57.8	52.8	....	....	18.6	28.8	40.1	42.4
Nutrition defects.....	71.1	74.6	61.6	61.4	....	....	38.1	40.5
Dullness.....	63.0	63.4	61.8	60.1	18.1	27.0	....	....

From this comparison Mr. Warner concludes that "scientific researches of public medicine might well be devoted to the removal of causes of defective development."

Mr. Warner also makes a comparison of the condition of children in regard to social class, nationality, and resident and day schools. He finds that "homes" and "orphanages" present fewer defective cases than do the certified industrial and poor law schools. Ten thousand children in 20 upper class day schools were compared with 26,000 children in 52 day schools of lower social class, with the result that the percentages went against the upper class in all respects.

A comparison of the conditions of children in English, Irish, and Jewish schools yielded some interesting facts. The Irish children appeared to be more defective than were the English. Thirty per cent of the former were noted as abnormal, as against 17 per cent of the latter. The Jewish children were the least defective, only 15 per cent were noted.

Among the "developmental defects" "cranial abnormality" is said to be the most noteworthy. These were divided into three groups, "small heads," "large heads," and "bosses on the cranium."

The last two defects are known to be due to rickets, which is a preventable condition. "Small heads" formed the largest sub-group, and was noticeable as affecting girls more than boys. Also this condition was more common among the poorer classes.

The following facts were demonstrated in regard to cases of "low nutrition": —

1. Girls suffered more than boys.
2. The correlation of low nutrition with development defect was higher for girls than for boys.
3. Low nutrition was less frequent in resident than in day schools.

FREE CHURCH STATISTICS.

Interesting returns have recently been compiled by Rev. W. C. Winslow, D.D., showing the steady growth of free sittings in churches of the Episcopal denomination.

In 1882, of 119 churches and chapels in the diocese of Massachusetts, 60 had free sittings; today, of 195 churches, chapels, and places of worship, 126 have free sittings; so that instead of about half nearly two-thirds of the churches are free. The total number of sittings in all places of worship of this church in Massachusetts is 52,334, of which 30,166 are free and 22,168 are not free. The disproportion of the number of free churches and free sittings in the total is owing to the fact that some of the largest parishes have pewed churches. Trinity Church, Boston, *e. g.*, having 1600 sittings to 400 in a church that is free, like the Church of our Saviour in Longwood.

In 1879, out of about 3000 Episcopal parishes in the whole country, 45 per cent had free sittings; in 1885, out of 3300 parishes, nearly 70 per cent had free sittings.

In Quincy all churches are free; in Arkansas, Florida, and Springfield all but one; in Maine and Nebraska all but two; in Boston, Indiana, Mississippi, and Missouri all but three are free. The summary is as follows: In 52 dioceses, 1 has all the seats free; 8 have 95 per cent and over free; 13 have 90 per cent; 7 have 85 per cent; 5 have 80 per cent; 7 have 70 per cent; 6 have 60 per cent; 4 have 50 per cent; 1 has 29½ per cent; 52 averaging 77½ per cent and over free.

MISCELLANEOUS.

Address upon the Condition of Articulative Teaching in American Schools for the Deaf. By Alexander Graham Bell. Boston, 1893. Pp. 72.

The above address was delivered June 29, 1892, at the summer meeting of the Association to Promote the Teaching of Speech to the Deaf. A detailed statistical report is appended, which is valuable as showing the number of pupils in American schools for the deaf, and also the proportion which is taught speech. The following table summarizes these facts: —

	Total Pupils in Schools.	Percentage Taught Speech.
1884	7,482	27.2
1885	7,801	33.5
1886	8,050	30.8
1887	7,978	32.0
1888	8.372	38.8
1889	8,575	39.7
1890	8,901	41.3
1891	9,232	46.0

From this it will be seen that there has been a marked increase in the number of pupils taught speech.

Proceedings of the Twenty-third Annual Meeting of the National Board of Trades held in Washington, January, 1893. Boston, 1893. Pp. 254.

At the last meeting of the National Board of Trades a vigorous discussion took place in regard to the establishment of a statistical office under the auspices of the National Board of Trade. The idea originated with Mr. Price, who recently died, and was presented anew to the Board by Hon. Carroll D. Wright. It is proposed that this unofficial statistical Bureau should edit and distribute all general information relating to trade, transportation, production, commerce, etc., found in the official reports of this and other countries. In the opinion of Mr. Wright, "the government cannot undertake editorial work or the compilation of foreign statistics in connection and in comparison with its own. This should be done and can only be done by a complete business organization, under the control of the business interests of the whole country." It was suggested that if 1000 affiliated bodies would subscribe $100 per annum each, the work would be carried on successfully. The discussion covers pages 169–183 of the above report.